Cold-Rolled Products

Cold Rolled

Appliance Steel

家电用钢

Technical Manual of Steel for Appliances

家电用钢产品手册

Contents

Foreword | 前言

目前，空调、洗衣机、冰箱、电脑等国内主要家电产品几乎有一半已穿上宝钢产品的“外衣”。宝钢家电用钢的年供应量目前约达 200 万吨，包括冷轧产品、热镀（铝）锌产品、电镀锌产品以及彩涂产品。

宝钢以一流的技术、设备以及营销服务理念，使生产出的家电用钢能不断满足用户提出的需求，并通过先进的订货系统和生产运营控制及发货系统，保证产品按时送达目的地。

宝钢注重环境保护，在维护清洁生产、打造绿色宝钢的同时，致力于环保产品的研发，以满足家电行业对供应商提出的所供材料不含 RoHS 指令中的有害物质、在生产过程中不人为添加有害物质的要求。

宝钢充满活力与发展机会，期待与您共创现代生活。

Nearly half of all household appliances made in China are made utilizing Baosteel's products. With an annual output of 2 million tons of steel specifically for appliances, Baosteel can readily supply cold rolled products, hot-dip galvanized products, electro-galvanized products and color coated products.

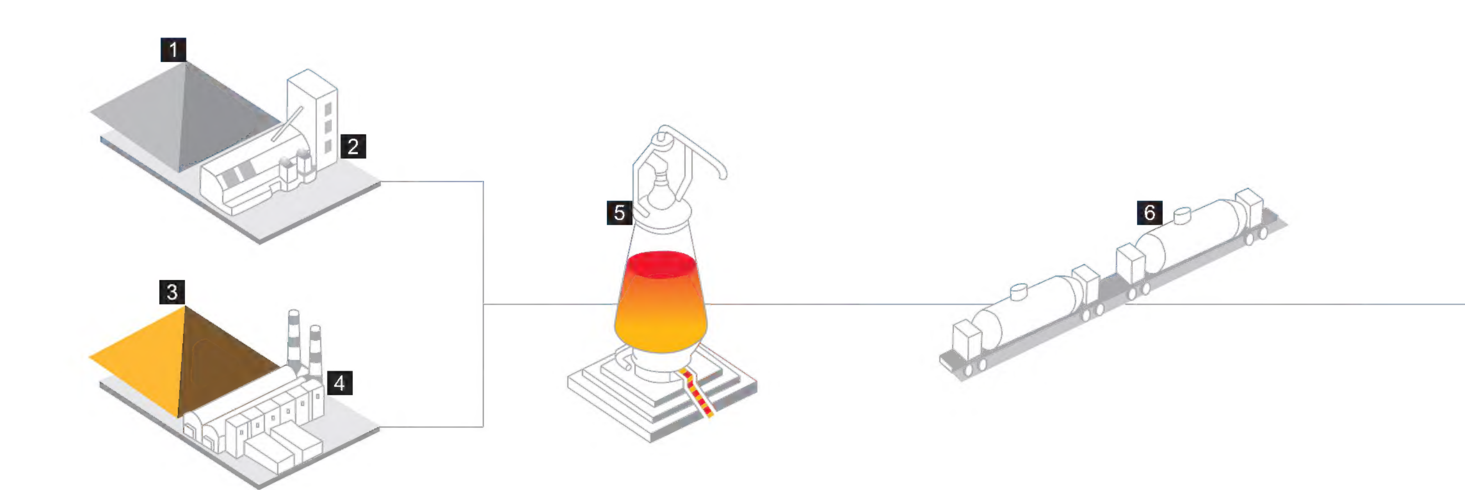
Operating with the finest equipment available and utilizing the most advanced technology, along with superior marketing and service will always ensure that Baosteel's production of household appliance steel will always meet the customers' particular requirements. Timely product supply is assured based upon our systematic ordering process, our proven production and controls system, and our performability.

Baosteel has a strong commitment to protecting the environment and maintaining clean steel production is our first step. We also direct our efforts in research and development towards enviromentally friendly products.

本手册综合介绍宝钢生产的各种家电用冷轧及镀锌产品的品种规格和表面特征，并着重介绍符合欧盟 RoHS 指令的环境友好型产品的特性及其相关使用技术，使下游业者能详细了解并合理使用好宝钢产品，共同提升家电产品的品质。

This manual serves as a guideline of information regarding Baosteel's products and includes: grades, specifications, applications, properties and customer technologies. Our purpose is to take full advantage of each products characteristics to promote the highest quality of household appliance.

Production Flow Chart | 生产流程



- **社会要求**
  成本低
  保护环境

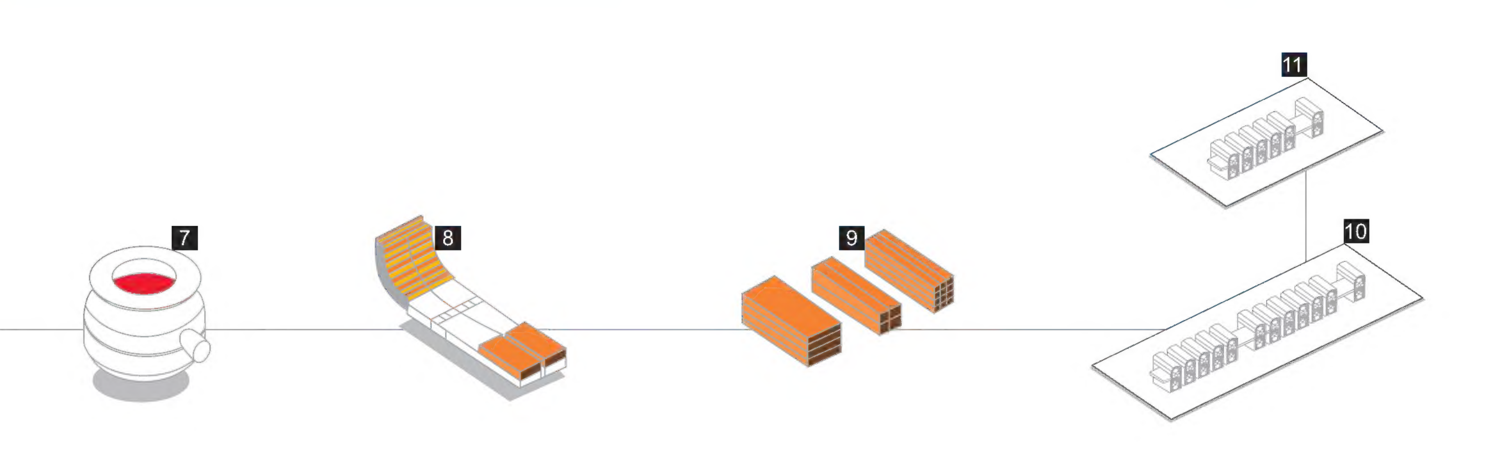
- **家电行业的要求**
  成形性好
  焊接性好
  涂装性好
  耐蚀性好
  加工效率高

- **宝钢的控制目标**
  尺寸精度高
  性能稳定
  镀层均匀

- **Requirement from general public**
  Low cost
  Environmental-friendly

- **Requirement from appliance manufacturer**
  Good formability
  Good weldability
  Good coating property
  Good anti-corrosion performance
  High workability

- **Targets to be under Baosteel's control**
  High precision in size
  Consistent performance
  Homogeneity in coating



1 煤 Coal	2 焦炉 Coke oven	3 铁矿石 Iron ore
4 烧结 Sintering	5 高炉 Blast furnace	6 鱼雷型铁水罐车 Torpedo
7 转炉 Converter	8 连铸机 Con-caster	9 连铸板坯 Continuous casting billet
10 热轧 Hot-rolled	11 轧机联合机组 CDCM	

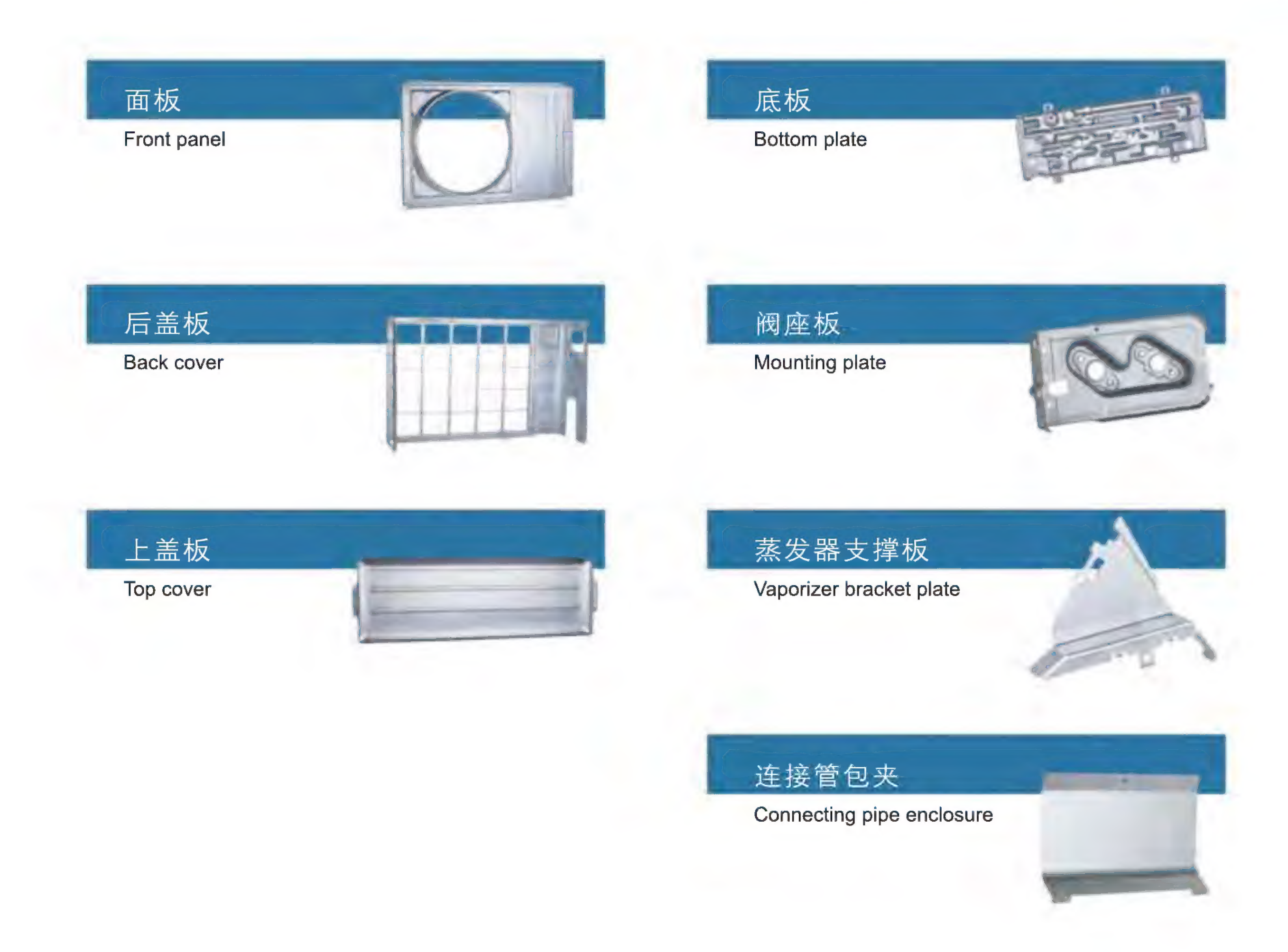
Products Selection

主要家电用钢选材介绍

- 白色家电用钢 — For white goods
- 米色家电用钢 — For cream goods
- 黑色家电用钢 — For black goods

TECHNICAL MANUAL
OF STEEL FOR APPLIANCES

Air Conditioner | 空调



零部件 Part	电镀锌 Electro-galvanized sheet	热镀锌 Hot-dip galvanized sheet	热镀锌铁合金 Galvannealed sheet	家电彩涂板 Pre-painted steel sheet for appliance
面板 Front panel	✓	✓	✓	✓
后盖板 Back cover	✓	✓	✓	
上盖板 Top cover	✓	✓	✓	✓
底板 Bottom plate	✓	✓	✓	
阀座板 Mounting plate	✓	✓	✓	
蒸发器支撑板 Vaporizer bracket plate		✓		
连接管包夹 Connecting pipe enclosure		✓		

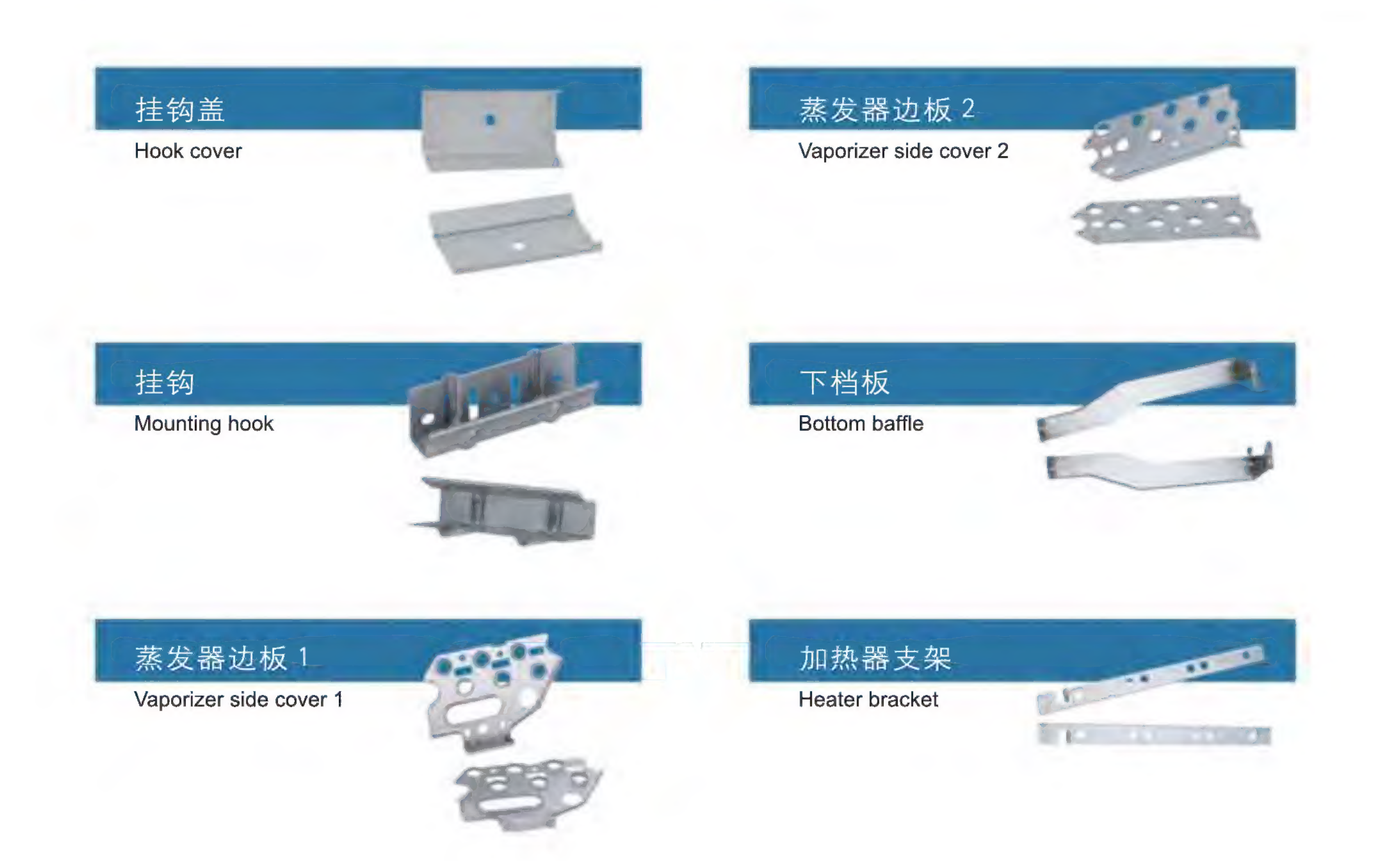
涂装后使用的零部件根据用户的不同需求，涂装后使用的零部件可选用电镀锌、热镀锌铁、热镀锌产品。

The substrate of coated parts can be selected from electro-galvanized sheet、hot-dip galvanized sheet、galvannealed sheet, depending on the usage or working environment.

裸露使用的零部件建议选用热镀锌产品。

For exposed parts, hot-dip galvanized sheet is the best choice.

Air Conditioner | 空调



零部件 Part	电镀锌 Electro-galvanized sheet	热镀锌 Hot-dip galvanized sheet	热镀锌铁合金 Galvannealed sheet
挂钩盖 Hook cover		✓	
挂钩 Mounting hook		✓	
蒸发器边板1 Vaporizer side cover 1		✓	
蒸发器边板2 Vaporizer side cover 2		✓	
下档板 Bottom baffle		✓	
加热器支架 Heater bracket		✓	

涂装后使用的零部件根据用户的不同需求，涂装后使用的零部件可选用电镀锌、热镀锌铁、热镀锌产品。

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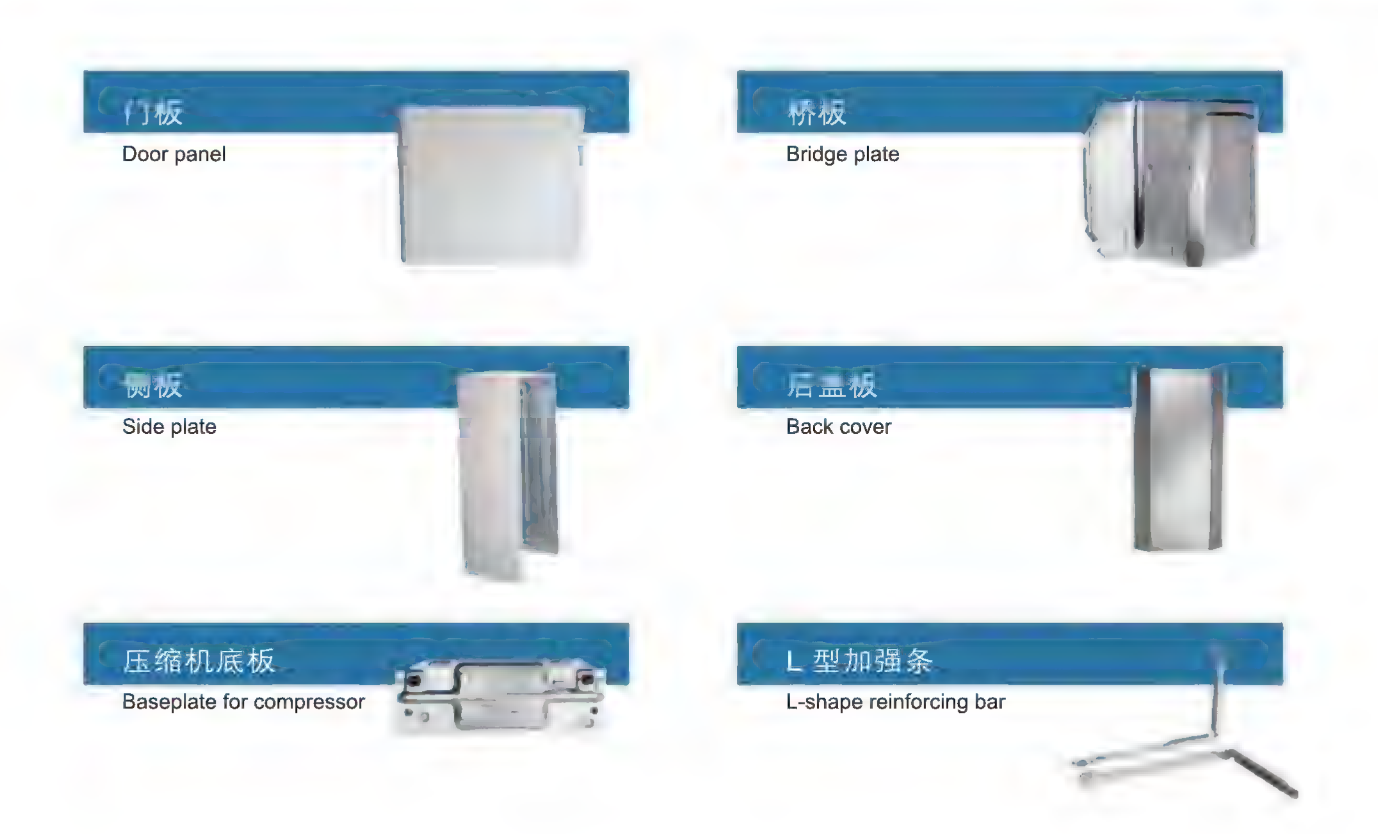
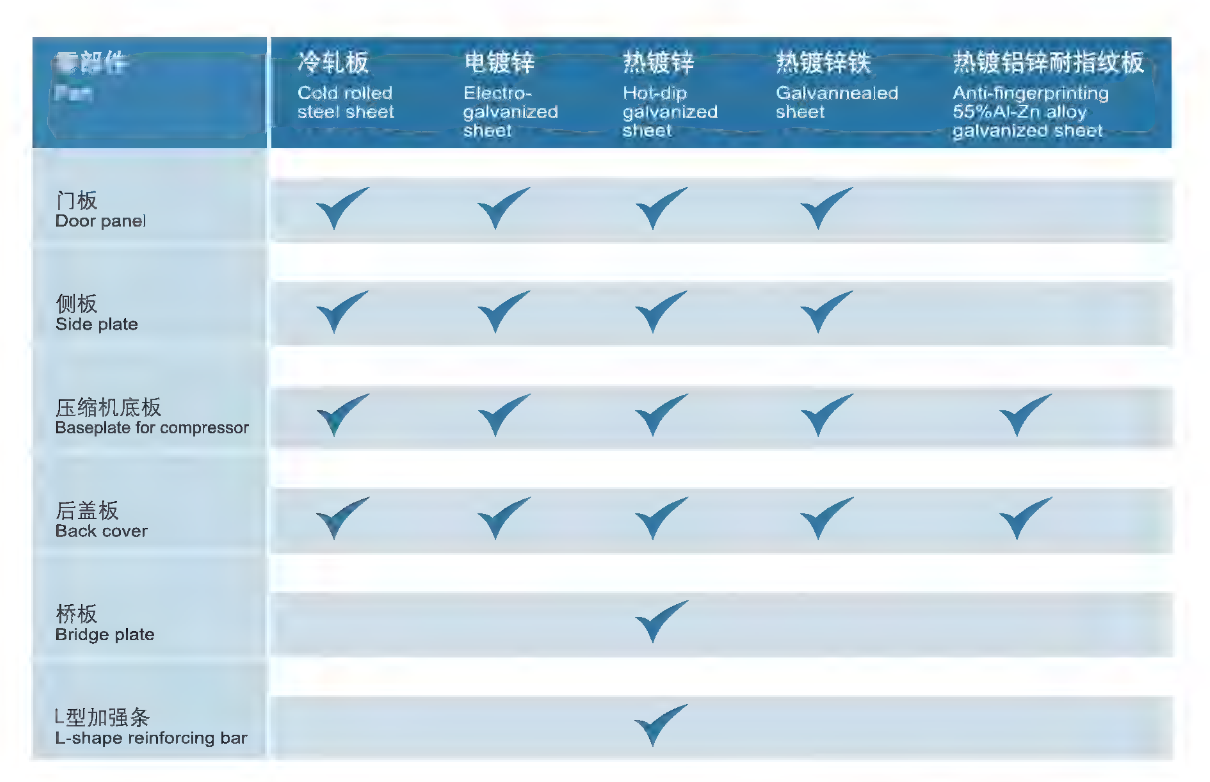
Refrigerator | 冰箱





零部件 Part	冷轧板 Cold rolled steel sheet	电镀锌 Electro-galvanized sheet	热镀锌 Hot-dip galvanized sheet	热镀锌铁 Galvannealed sheet	热镀铝锌耐指纹板 Anti-fingerprinting 55%Al-Zn alloy galvanized sheet
门板 Door panel	✓	✓	✓	✓	
侧板 Side plate	✓	✓	✓	✓	
压缩机底板 Baseplate for compressor	✓	✓	✓	✓	✓
后盖板 Back cover	✓	✓	✓	✓	✓
桥板 Bridge plate			✓		
L型加强条 L-shape reinforcing bar			✓		

涂装后使用的零部件根据用户的不同需求，涂装后使用的零部件可选用电镀锌、热镀锌铁、热镀锌产品。

The substrate of coated parts can be selected from cold rolled steel sheet、electro-galvanized sheet、hot-dip galvanized sheet、galvannealed sheet, depending on the usage or working environment.

裸露使用的零部件建议选用热镀锌产品。

For exposed parts, hot-dip galvanized sheet is the best choice.

Washing Machine | 洗衣机

零部件 Part	冷轧板 Cold rolled steel sheet	电镀锌 Electro-galvanized sheet	热镀锌 Hot-dip galvanized sheet	热镀锌铁 Galvannealed sheet
外壳 Casing	✓	✓	✓	✓
封门板 Door sealing plate	✓	✓	✓	✓
箱体连接板 Connecting plate for casing			✓	
底板 Base-plate			✓	
箱角 Case corner			✓	
固定板 Fastening plate			✓	
离合器 Clutch			✓	

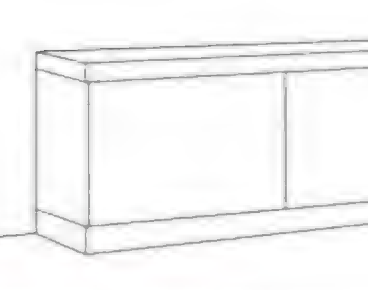
涂装后使用的零部件根据用户的不同需求，涂装后使用的零部件可选用电镀锌、热镀锌铁、热镀锌产品。

The substrate of coated parts can be selected from cold rolled steel sheet、electro-galvanized sheet、hot-dip galvanized sheet、galvannealed sheet, depending on the usage or working environment.

裸露使用的零部件建议选用热镀锌产品。

For exposed parts, hot-dip galvanized sheet is the best choice.

Computer | 电脑



机箱外壳
Computer cabinet casing

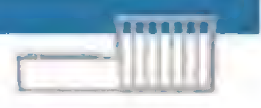
机箱框架
Frame of the cabinet

光驱支架
CD driver shelf

机箱主板固定板
Main board fixing plate of the cabinet

硬盘支架
Hard disc bracket

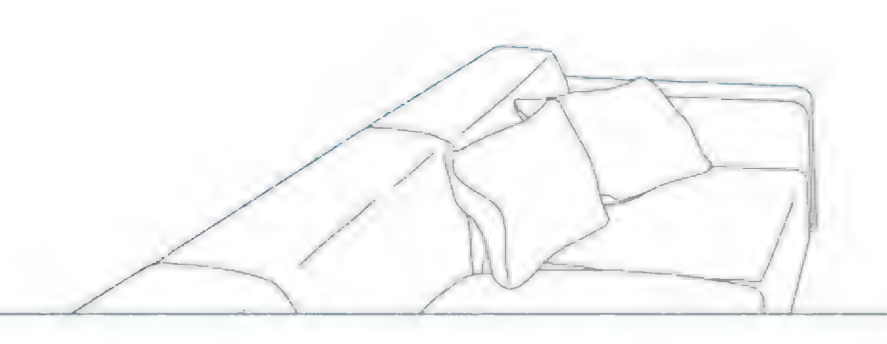
插座板
Socket rack



机箱外侧面
Outside side cover of the cabinet

零部件 Part	冷轧板 Cold rolled steel sheet	电镀锌 Electro-galvanized sheet	热镀锌 Hot-dip galvanized sheet	电镀锌／热镀锌耐指纹板 Anti-fingerprinting electro-galvanized / hot-dip galvanized sheet
机箱外壳 Computer cabinet casing				✓
光驱支架 CD driver shelf				✓
硬盘支架 Hard disc bracket				✓
机箱框架 Frame of the cabinet				✓
机箱主板固定板 Main board fixing plate of the cabinet				✓
插座板 Socket rack				✓

AV and OA Products | 视听及OA产品



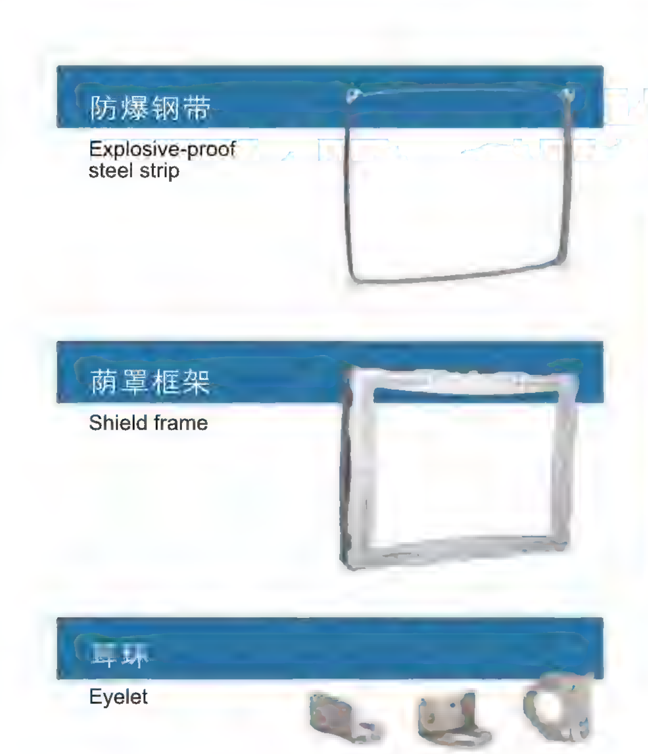
零部件 Part	热镀锌 无铬钝化板 Cr-free passivation hot-dip galvanized sheet	热镀锌 耐指纹板 Anti-fingerprinting hot-dip galvanized sheet	电镀锌 耐指纹板 Anti-fingerprinting electro-galvanized sheet
后背板 back cover		✓	✓
后围板 back panel		✓	✓
底板 bottom plate		✓	✓
上盖板 Top cover		✓	✓
液晶背板 LCD-Monitor		✓	✓
液晶模组 LCD-TFT Mould		✓	✓

视听器材后背板
AV back cover

视听器材后围板
AV back panel

视听器材底板
AV bottom plate

彩色显象管用钢带 | Color Cathode Ray Tube Shielded Band



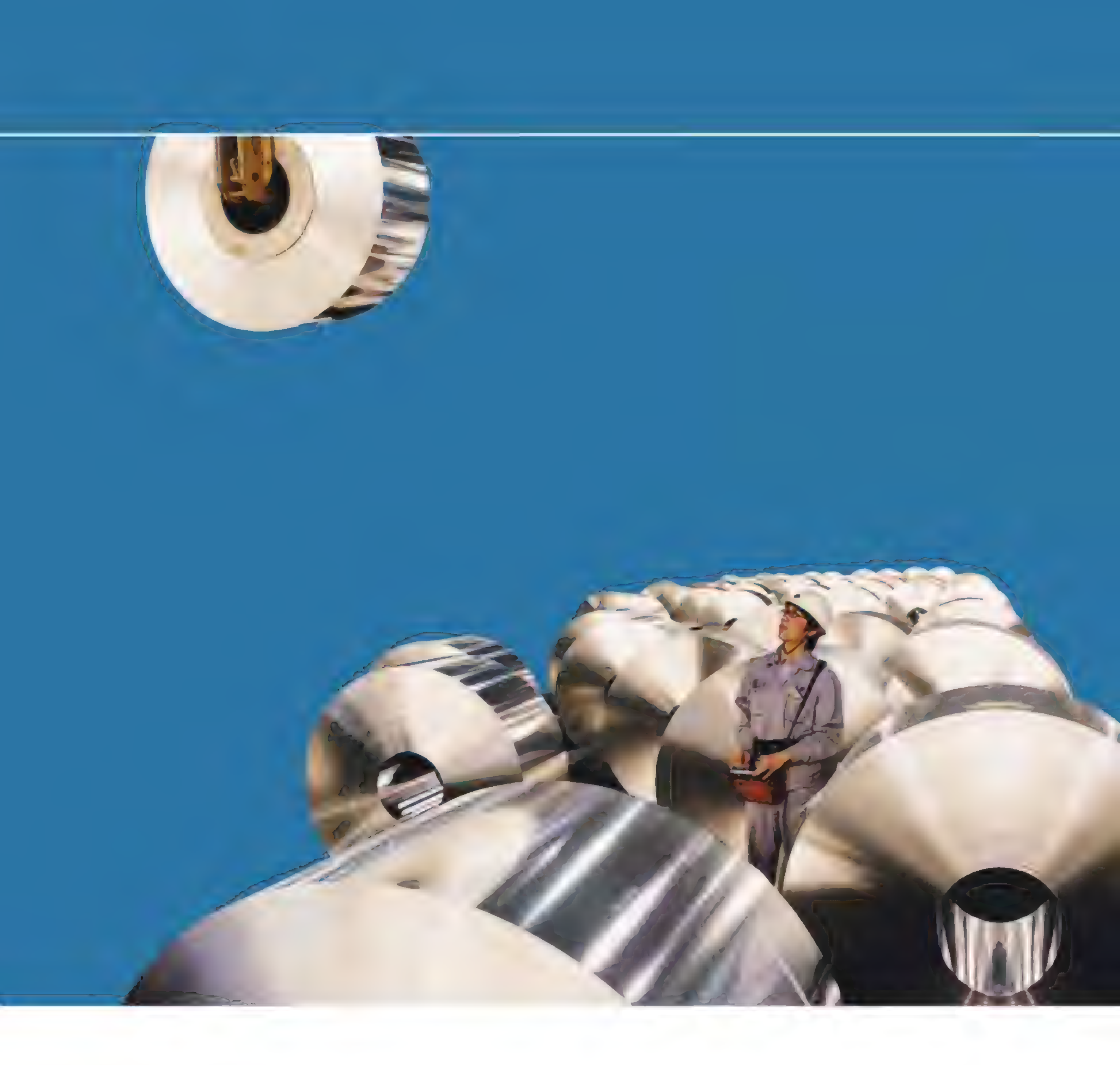
零部件 Part	冷轧板 Cold rolled steel sheet	电镀锌 Electro-galvanized sheet	热镀锌铁 Galvannealed sheet	热镀铝锌无铬钝化 Cr-free passivation Al-Zn alloy galvanized steel
防爆钢带 Explosive-proof steel strip			✓	✓
荫罩框架 Shield frame	✓			
耳环 Eyelet	✓			

Product Specifications

家电用钢的产品特性

- 牌号用途及力学性能
- 可供规格及其允许偏差
- 主要技术指标

- Grade, application and mechanical performance
- Specification available and its allowable deviation
- Main technical parameters



冷轧产品牌号及用途简介
Grade and application of cold rolled products

材料类别 Type of steel \ 标准及牌号 Standard & Grade	宝钢企业标准 Baosteel standard		相当国际标准 Equivalent foreign standard		说明 Remarks	
	标准号 Standard No.	牌号 Grade	标准号 Standard No.	牌号 Grade		
一般用 Commercial quality (CQ)	Q/BQB403-2003 Q/BQB402-2003 Q/BQB408-2003	DC01 SPCC BLC	DIN1623 JISG3141	St12 SPCC	冰箱等家电外壳、油桶、钢家俱等一般成形加工用。 Normal formed steel for refrigerator casing, oil barrel, steel furniture, etc.	
冲压级 Drawing quality (DQ)	Q/BQB403-2003 Q/BQB402-2003 Q/BQB408-2003	DC03 SPCD BLD	DIN1623 JISG3141	RRSt 13 SPCD	家电冲压成形加工用钢。 For drawing.	
深冲用 Deep drawing quality (DDQ)	Q/BQB403-2003 Q/BQB402-2003 Q/BQB408-2003	DC04 SPCE SPCEN BUSD、BUFD BSUFD	DIN1623 JISG3141	St14 SPCE SPCEN	深冲压成形加工用钢。 For deep drawing.	
电视机专用钢 Steel for TV	Q/BQB470-2003	SPCCCK BCK-1 BCK-2			彩色显像管用带钢。 Color cathode ray tube shielded band.	
白色家电专用钢 Steel for white goods	BZJ 471-2003	BLC-JD1			喷涂用 For spray coating	洗衣机外板 Casing for washing machine
		BLC-JD2				冰柜外板 Casing for ice chest
		BLC-JD3				冰箱侧板 Side plate for refrigerator
		BLD-JD1			覆膜用 For laminating	A类冰箱面板 Door panel for "A" class refrigerater
		BLD-JD2				
		BLD-JD3				B类冰箱面板 Door panel for "B" class refrigerater

冷轧产品主要牌号的力学性能简介

Mechanic performance for main grades of the cold rolled products

牌号 Grade	屈服强度[a] MPa ≤ Yield strength[a]	抗拉强度 MPa ≥ Tensile strength	断后伸长率(L_0=50mm b=25mm) % ≥ Elongation 公称厚度 mm Thickness				r值[b,c] ≥ r value[b,c]	n值[b,c] ≥ n value[b,c]
			<0.70	0.70~<1.0	1.0~<1.6	≥1.6		
DC01(St12)	130～260	270	28	30	32	34	–	–
DC03(St13)	120～240	270	32	34	35	36	–	–
DC04(St14, St15)	120～210	270	36	38	39	40	1.5	0.18
			<0.60	0.60~<1.0	1.0~<1.6	≥1.6		
SPCC	–	270	34	36	37	38	–	–
SPCD	–	270	36	38	39	40	–	–
SPCE、SPCEN	210	270	38	40	41	42	–	–
BLC	140～270	270	36	38	40	42	–	–
BLD	120～240	270	38	40	42	44	1.4	0.18
BUSD	120～210	260	40	42	44	46	1.6	0.20
BUFD	120～190	250	42	44	46	48	1.8	0.21
BSUFD	110～180	250	44	46	48	50	2.0	0.22
BLC-JD1	–	–	–	–	–	–	–	–
BLC-JD2	–	–	–	–	–	–	–	–
BLC-JD3	–	–	–	–	–	–	–	–
BLD-JD1	170～220	–	–	–	–	–	–	–
BLD-JD2	195～245	–	–	–	–	–	–	–
BLD-JD3	200～260	–	–	–	–	–	–	–

a 当屈服现象不明显时采用$R_{P0.2}$，否则采用R_{eL}。
$R_{P0.2}$ will be adopted where the yield phenomenon is not presented explicitly, otherwise R_{eL}.

b 对于牌号DC04其r值、n值为r_{90}和n_{90}；
For the grade DC04, its r value and n value are respectively r_{90} and n_{90}.

c $\bar{r}=(r_{90}+2r_{45}+r_0)/4$；$\bar{n}=(n_{90}+2n_{45}+n_0)/4$

冷轧产品可供规格范围

Range of specifications available for the cold rolled products

项目 Item		公称尺寸(mm) Dimension
厚度 Thickness		0.3~3.5
宽度 Width		800~1830
长度 Length	钢板 Sheet	1000~6000
	钢带 Strip	卷内径：610、508 Coil inner diameter

白色家电专用钢可供规格范围

Range of specifications available for the white goods

牌号 Grade	厚度(mm) Thickness	宽度(mm) Width
BLC-JD1	0.50～0.60	700～1280
	＞0.60～1.30	800～1350
BLC-JD2	0.50～0.60	700～1250
	＞0.60～1.30	800～1350
BLC-JD3	0.50～0.60	700～1280
	＞0.60～1.30	800～1400
BLD-JD1	0.50～0.60	700～1280
	＞0.60～1.30	800～1350
BLD-JD2	0.50～0.60	700～1250
	＞0.60～1.30	800～1350
BLD-JD3	0.50～0.60	700～1280
	＞0.60～1.30	800～1400

电镀锌产品牌号
Grade of the electro-galvanized products

材料类别 Type of steel	标准及牌号 Standard & Grade			
	标准号 Standard No.	牌号 Grade	标准号 Standard No.	牌号 Grade
冲压用 Drawing	Q/BQB 430-2003	SECC SECE SECD	Q/BQB 402-2003	SPCC SPCD SPCE
		SECIF	Q/BQB 403-2003	DC05(BSC2)
		BLCE+Z	Q/BQB 408-2003	BLC
		BLDE+Z		BLD
		BUSDE+Z		BUSD

电镀锌产品的力学性能应符合对应基板的规定

The mechanical performance of electro-galvanized steel corresponds to the substrate's mechanical performance

电镀锌产品可供规格范围
Range of specifications available for the electro-galvanized products

项目 Items		公称尺寸(mm) Dimension
厚度 Thickness		0.3~3.5
宽度 Width		800~1830
长度 Length	钢板 Sheet	1000~6000
	钢带 Strip	卷内径：610、508 Coil inner diameter

电镀锌镀层重量
Coating weight of the electro-galvanized

镀层形式 Coating	镀层重量 g/m^2 Types of coating
等厚 Equal coating mass	纯锌镀层 Zinc coating
	3/3, 10/10, 15/15, 20/20, 30/30, 40/40, 50/50, 60/60, 70/70, 80/80, 90/90

热镀锌产品牌号及用途简介

Grade and application of the hot-dip galvanized products

材料类别 Type of steel	标准及牌号 Standard & Grade		应用 Application
	标准号 Standard No.	牌号 Grade	
非合金化热镀锌 Hot dip galvanized steel sheet	Q/BQB 420-2003	DC51D+Z, DC52D+Z DC53D+Z, DC54D+Z	包括一般用、机械咬口用、深冲用、超深冲用材质。当镀量大时，耐腐蚀性优越，可作暴露件用；镀锌量小时，加工性能良好。 Incl. materials for general-purpose, form-locking, deep drawing and extra-deep drawing. Offering good corrosion resistance for exposed parts with thick coating and good workability with thin coating.
		S220GD+Z	可作结构用，耐腐蚀性和加工性能良好。 Offering high corrosion resistance and good workability for structure.
合金化热镀锌钢带 Galvannealed steel sheet		DC51D+ZF, DC52D+ZF, DC53D+ZF, DC54D+ZF	包括冲压用、结构用、冷成型用材质，与纯锌镀层相比，合金化热镀锌的涂附性和焊接性能更优越，但在加工过程中易产生粉化剥离。 Incl. materials for drawing, structure, cold forming. Offering the coating adhesion and weldability better than the galvanized steel sheet, but has a tendency to powder when severely formed.
低碳钢和/或超低碳钢 Low carbon steel / ultra low carbon steel		DC51D+Z(St01Z,St02Z, St03Z,DC51D+Z) DD51D+Z(St01ZR,St02ZR)	一般用 Normal use
		DC52D+Z(St04Z),DC52D+ZF	冲压用 For drawing
超低碳钢 Ultra low carbon steel		DC53D+Z(St05Z),DC53D+ZF	深冲用 For deep drawing
		DC54D+Z(St06Z),DC54D+ZF	特深冲用 Ultra drawing,high formability

热镀锌产品力学性能简介

Mechanic performance for hot-dip galvanized products

牌号 Grade	屈服强度 MPa Yield strength	抗拉强度 MPa Tensile strength	断后伸长率(L_0=50mm b=25mm) % ≥ Elongation L_0=80mm b=20mm 公称厚度 mm Thickness		n_{90} ≥	r_{90} ≥	镀层附着性 Coating adhesion 下列镀层重量（g/m²）时的弯心直径*（a=板厚）		
			≤0.7	>0.7			≤140/140	>140/140-175/175	>175/175
DD51D+Z(St01ZR, St02ZR)		270-500	–	–	–	–	0a	0a	0a
DC51D+Z(St01Z,St02Z, St03Z), DC51D+ZF		270-500	20	22	–	–			
DC52D+Z(St04Z), DC52D+ZF	140-300	270-420	24	26	–	–			
DC53D+Z(St05Z), DC53D+ZF	140-260	270-380	28	30	–	–	0a	1a	2a
DC54D+Z(St06Z)	140-220	270-350	34	36	0.18	1.6			
DC54D+ZF			32	34		1.4			
S220GD+Z	≥220	≥300	18	20			1a	1a	1a

* 对于差厚镀层产品，厚镀层面作为弯曲试验的外表。
Regarding the differential coating product, the thicker coating layer can be used as the surface for bending test.

热镀锌产品可供规格范围

Range of specifications available for the hot-dip galvanized products

项目 Item		公称尺寸(mm) Dimension
厚度 Thickness		0.3~2.75
宽度 Width		800~1830
长度 Length	钢板 Sheet	1000~6000
	钢带 Strip	卷内径：610 Coil inner diameter

热镀锌镀层重量
Coating weight of the hot-dip galvanized

镀层形式 Coating	镀层种类 Coating type	推荐的镀层重量 g/m² Suggested coating weight
等厚 Equal coating mass	Z, ZF	40/40 50/50 60/60 70/70 80/80 90/90 100/100 125/125 140/140 175/175 225/225

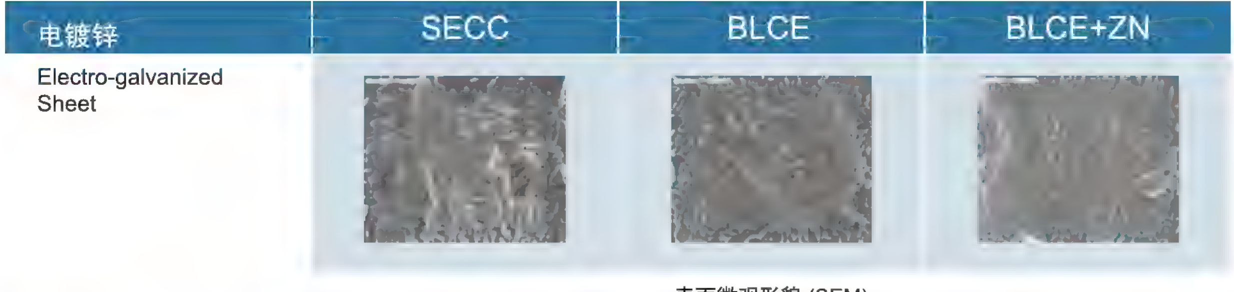
备注：ZF 镀层重量范围为 30/30～90/90 g/m²
Note: The range of coating weight for ZF is 30/30~90/90 g/m²

热镀锌镀层表面
Surface of the hot-dip galvanized

表面结构 Surface texture	代号 Code	特征 Feature	用途 Usage
正常锌花 Spangle	Z	镀锌后在通常条件下锌层冷凝而得的锌花。The spangle obtained while hot dipped steel strip is cool down with normal speed.	一般用途 Commercial
小锌花 Small spangle	X	通过对锌层的确控制冷凝而形成的表面，呈现比正常锌花小的细小锌花。The spangle obtained while hot dipped steel strip is cooled down with controled speed, the size of the spangle less than normal spangle.	用于正常锌花不能满足表面外观要求的用途。Applications for higher surface quality than that of normal spangle.
光整锌花 Skin passed spangle	G	经专门光整处理得到的表面结构。The surface texture obtained after temper rolling.	用于高表面质量要求的用途，如：用作彩涂基板。Applications for high surface quality. eg. substrate for colour coated steel.
光整小锌花 Skin passed small spangle	GX		
零锌花 Spangle free	N	采用特定生产工艺使镀层表面无肉眼可见的锌花。No visible zinc spangle on the coating surface for specified production process is adopted.	–
锌铁合金 Galvannealed	R	无锌花，灰色，一般无光泽。Coating is zine-iron alloy without zinc spangle, and normally no shine.	适用于进一步涂漆 Suitable for painting

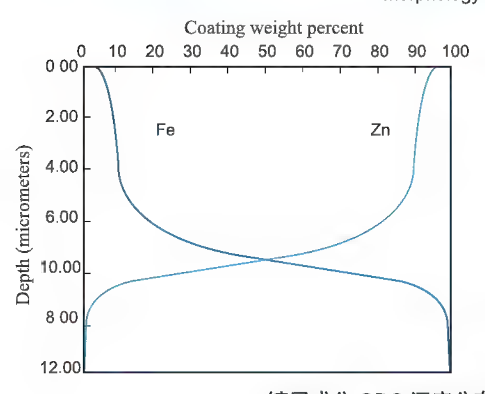
产品表面特性 | Surface Characteristics

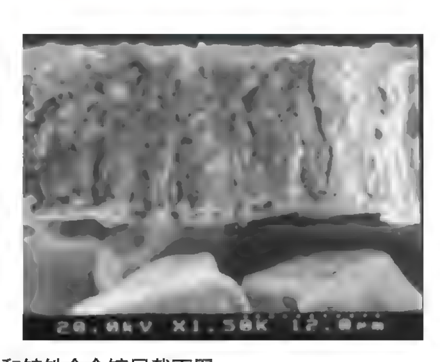
表面微观形貌 (SEM)
Morphology



表面微观形貌 (SEM)
Morphology

表面微观形貌 (SEM)
Morphology





镀层成分 GDS 深度分布图和锌铁合金镀层截面图
GDS depth distribution of coating composition and cross-sectional of GA coating

Coating Technologies
家电用钢涂装技术

- 除彩涂板外，所有的家电外覆盖件在制成成品前均需要作涂装处理，以提高家电产品中钢铁件的使用寿命和装饰性。

- In adddition to color-coated steel sheet, all body panels of home appliances need to be dealt with coating, to improve the life of home appliances and decoration.

Coating Technology
涂装技术

● 提高家电产品中钢铁件的使用寿命

所有的钢铁件在空气中均会通过与腐蚀介质(空气中的 O_2、H_2O、Cl 等)的接触渗透而发生锈蚀、腐烂,直至失去原有的机械强度。为延缓锈蚀的发生,最常用的手段是在钢铁件表面涂上一层有机涂层,使钢铁件与腐蚀介质隔绝,起到物理保护的作用。

○ Prolonging the service life of the steel pieces used in the household appliance products

All the iron and steel pieces will never escape the possibility of corrosion, decaying, even loss of original mechanical strength on the account of contact with and penetration of corrosive media in the air (O_2, H_2O, Cl etc. contained in the air). To inhibit the corrosion from occurring as long as possible, the approach that is frequently resorted to is applying organic coating on the surface to serve as a physical protection, by isolating it from the corrosive media.

● 装饰性

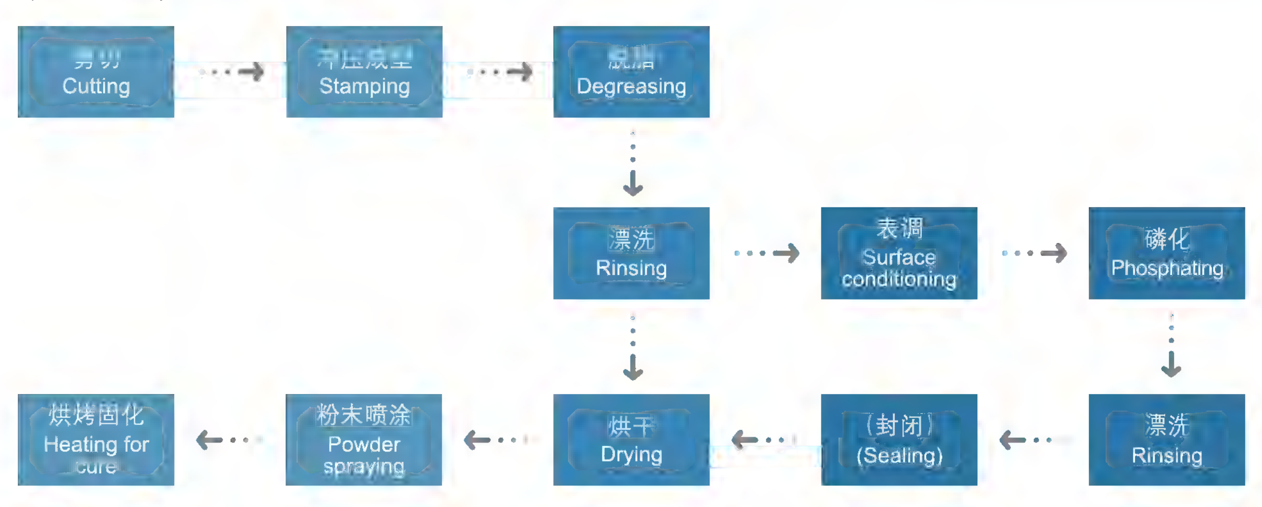
通过有机涂层的涂装,可彻底改变钢板冷冰冰的单调外观。有机涂层能赋予钢板以各种颜色、质感,满足美学的要求。

○ Decoration function

Coating treatment with organic coating is such that the cold-as-steel and monotonous appearance of the steel sheet can be re-made thoroughly. The organic coating beautifies the steel sheet with different color and amplifies its sense of quality, meeting the aesthetical requirement.

- **典型涂装工艺流程**

Typical coating process flow



工艺段名称 Process	作 用 Function	基本原理 Principle	工作方式 Mode
脱 脂 Degreasing	产生洁净的金属表面 Make suface clean	碱性水剂脱脂 Water-borne detergent	喷 淋、浸渍 Spray, dip
表 调 Surface conditioning	金属表面改性，使之易于附着磷化膜 Modify the surface of substrate	化学法表面调整，形成磷化晶核 To form nuclei of phosphate crystal	喷 淋、浸渍 Spray, dip
磷 化 Phosphating	形成利于有机涂层附着和抗膜下腐蚀的化学转化膜 Form conversion coating with corrosion resistance and coating adhesion function	伪转化型单元或多元锌系磷化 Zinc or tri-cation phosphate crystal	喷 淋、浸渍 Spray,dip
喷 涂 Spray coating	形成装饰和高耐蚀表面 decorative and good corrosion-resistance surface	有机粉末涂料 Organic powder coating	静电喷涂 Electrostatic painting
固 化 Curing	有机涂料固化成膜 Make the coating cross-linking	热交联固化 Cross linking	加热固化 Heat

常用脱脂工艺及基本原理

常用的脱脂工艺有两种：碱性水基脱脂和有机溶剂脱脂

Regular degreasing process and its basic principle

There are two types of degreasing process in popular use-water-borne alkaline degreasing and organic solvent degreasing

碱性水剂脱脂

将碱性化学脱脂剂以喷、刷、浸、电解等方式与钢板表面的防锈油膜接触并发生物理及化学反应，将防锈油及钢板生产过程中吸附的残碳、铁粉等异物除去。

常用的碱性脱脂剂由 NaOH、Na_2CO_3、Na_3PO_4 等碱金属盐及复配的表面活性剂按比例溶解于水而成；当被处理材是镀锌板或耐指纹板时，考虑到镀锌层和有机膜的耐碱性，应适度降低脱脂剂的碱度。

工作时通过对油膜的渗透、侵润、乳化和分散作用，使油被乳化成牛奶状的混合物-乳化液，并包裹着碳粉、铁粉等杂质，离开钢板进入脱脂液中，达到除油清洁的目的。

Water-borne detergent degreasing

The detergent will react with the rust preventive oil on the steel sheet surface, physically and chemically, by way of spraying, brushing, dipping or in electrolytic manner etc. to remove the preventive oil and such impurities as residual carbon, iron powder and so on absorbed in the process of production.

The common detergent is made of NaOH, Na_2CO_3, Na_3PO_4 and other alkali metal salts in a proportion to the compound surface active agent, then solved in water. Where the galvanized sheet or anti-fingerprint sheet is treated, consideration shall be taken into the alkali resistance of the galvanizing coating and of the organic film, and the alkalinity of detergent ought to be properly reduced.

The detergent reacts with oil film by means of penetration, soaking, emulsion and separation, to emulsify the oil into milk-like compound - emulsion, which carries with it the impurities such as powdery carbon, iron etc. departing off the sheet and is discharged into degreasing solution. Thus doing the end is served of oil removal and cleaning.

有机溶剂脱脂

将带油的金属工件置于三氯乙烷、三氯乙烯等的蒸汽中将油膜从金属表面除去。

通过有机溶剂对防锈油的溶解和稀释，将粘度大的油降低到十分低的粘度，使油与金属表面松弛，再通过包围它的溶剂而冲掉。

为强化溶解效果，常辅以超声波清洗。

当电镀锌／热镀锌耐指纹钢板表面轻微沾污时，可用蘸有乙醇或丙醇的干净软布擦拭，达到去污清洁的效果。

Organic solvent degreasing

It is to place the oil-contained metal pieces in the vapor composed of trichloro-ethane and trichlorethylene etc. to take the oil film off the metal surface.

As a result of dissolution and dilution to rust preventive oil by organic solvent, the oil viscosity ever high will be reduced to a very low degree whereby oil slackens off the metal surface, then is washed away with the solution carrying it.

Ultrasonic cleaning is frequently adopted to enhance the dissolution effect.

When the electro-galvanized / hot-dip galvanized anti-fingerprinting steel surface slightly soiled, it can take a dip ethanol or acetone soft cloth to wipe the plate, so as to achieve decontamination cleansing effect.

常用磷化工艺及基本原理

磷化处理是将被处理金属置于磷化液中，通过磷化液中磷酸二氢盐与金属的反应在表面生成一层致密的化学转化膜，作为喷涂有机涂层的化学前处理。处理方式通常为喷淋或浸渍。

家电磷化以伪转化型磷化为主，极少量采用转化型磷化（仅适用于冷轧板）。前者附着力与耐蚀性好，后者的加工性更好，处理时间更短，适合于快速流水线。

磷化能把金属表面的活性转化到最小的程度，把以后的腐蚀反应降到最低限度。

磷化膜能给金属提供一个“粗糙面”，给油漆或其他有机膜提供一个很好的咬合，增强其附着力。

磷化膜的等电位和绝缘性抑制了有机涂层的膜下腐蚀蔓延。

镀锌钢板涂装后由于锌层的牺牲阳极保护作用而有良好的防穿孔腐蚀性能，冷轧板由于磷化膜中含 Fe, 能形成抗碱性优异的 $Me_2Fe(PO_4)_2 \cdot 4H_2O$ 晶体，从而在防止膜下腐蚀蔓延方面有优势。

Regular phosphating process and its basic principle

Phosphating treatment is to place the metal to be treated into the phosphating solution where a layer of compact chemical conversion film is formed on the surface of metal reacting with dihydrogen phosphate in the phosphating solution, which serves as pre-chemical treatment of organic coating. The treatment is usually spraying or dipping. Phosphating of steel for appliance is adopting much more frequently the pseudo-conversion phosphating than the conversion phosphating (the latter applicable only to the cold rolled sheet). The former is featured as one with good adhesion and corrosion-resistance while the latter is of better workability and shorter handling time, suitable for fast streamline production.

Phosphating can inhibit the activity of metal surface to a minimum possible degree and minimize the subsequent corrosion action to a lowest possible level.

Phosphating film creates a “rough face” to the metal, providing a good bonding interface for paint or other organic coating and resultantly reinforcing the adhesion.

Equipotential and insulation with respect to phosphating film deter the corrosive creepage under the film of organic coating.

After coating the galvanized steel sheet has excellent resistance-to-punching corrosion by the reason of sacrificial protective action. The cold rolled sheet, due to the fact that Fe is contained in the phosphating film of it therefore capable of forming $Me_2Fe(PO_4)_2 \cdot 4H_2O$ crystal excellent in alkali-resistance, is outperforming in preventing the corrosive propagation under film.

常用喷涂工艺及基本原理

家电制造业中最常用的喷涂工艺是静电粉末涂装法。静电粉末涂装法是运用高压电场感应效应，使粉末涂料和被涂物件受感应而分别带上彼此相反的电荷，把粉末涂料吸附到被涂物件上去，然后把被涂物件放在烘烤炉烘烤流平成膜。热塑性粉末涂料只需要熔融流平即可，而热固性粉末涂料流平后还要交联固化成膜。

Regular coating technology and its basic principle

The most popular coating technology in the household appliance manufacturing industry is electrostatic powder coating process. It is to apply induction, by means of induction effect of high-voltage electric field, on powder coating and the target part, so loaded with the opposite electric charge that the powder coating is absorbed onto the target part. The target parts will then be put in the baking oven for baking to flow flat into film. The powder coating is classified into two: thermoplastic type and thermosetting type. The former is made simply by its fusion to flow flat; the latter, after flow flat, still need cross-linking hardening to form film.

● 静电粉末喷涂有如下优点：

被涂物表面处理后可直接进行喷涂；

适用于50-150μm厚度的涂膜，涂膜厚度均匀，不容易流挂；

对被涂物的适应性强，可以喷不同大小和形状的被涂物，包括管道的内外壁；

对各种粉末涂料的适应性强，喷溢的粉末涂料可以回收利用，涂料的利用率高。

○ Electrostatic powder coating process has the following merits:

It can be applied directly onto the target parts after its surface treatment;

It is applicable where the coating thickness is between 50-50μm, and is of uniform thickness, no flowing mark.

It is widely applicable to the different target parts, can be used on target part in different size and different shape, including inner and outer wall of the pipe.

It is flexibly adaptable to various kinds of powder coating; the spilt powder coating can be reclaimed for use. Its utilization efficiency therefore is high.

● 典型家电行业用钢的涂装性实例

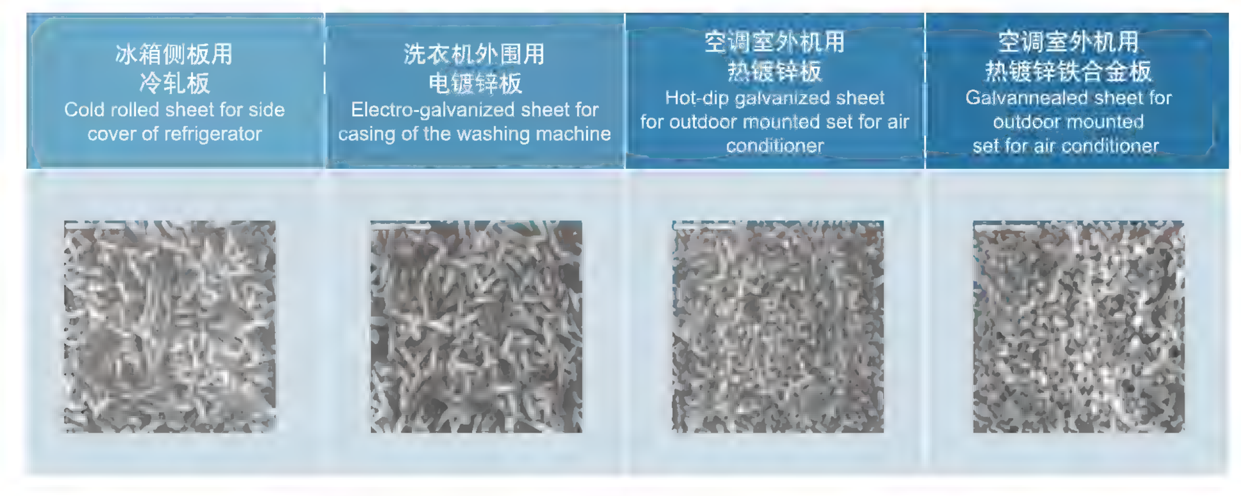
可磷化性

在一般伪转化型的多元锌系磷化体系和正常工艺条件下，冷轧板、镀锌板和热镀锌铁合金板都具有优良的可磷化性，磷化膜结晶细密，膜重一般可达2-4g/m^2。

○ Examples in illustration of coating performance for typical steel for appliance

Phosphatibility

In a trication Zinc based phosphating system for general pseudo-conversion phosphating and under normal process conditions, the cold rolled sheet, galvanized sheet and galvannealed sheet are exclusively of excellent phosphatibility, the phosphating film is compactly crystallined and weighed as to be ranging in 2-4g/m^2.



各种钢板在家电涂装线上处理的磷化膜微观形貌(SEM照片)
The morphology of phosphating film treated on the electrical appliance coating line of various steel sheets (SEM)

涂层附着力
Adhesion

试验项目 Test item		冰箱侧板用 冷轧板 Cold rolled sheet for side cover of refrigerator	洗衣机外围用 电镀锌板 Electro-galvanized sheet for casing of the washing machine	空调室外机用 热镀锌板 Hot-dip galvanized sheet for outdoor mounted set for air conditioner	空调室外机用 热镀锌铁合金板 Galvannealed sheet for outdoor mounted set for air conditioner
一次附着力 Adhesion	划格 Cross hatch tape test	★	★	★	★
	冲击 Impact test	★	★	★	★
二次附着力* Wet adhesion	划格 Cross hatch tape test	★	★	★	★
	冲击 Impact test	★	★	★	★
试验方法 Test method	划格 Cross hatch tape test	1mm间隔地划100格，Scotch 600#胶带剥离试验 Make the cross hatch cut with the sharp cutting tool. The number of lines in each direction are II and the spacing between lines is 1mm, sctoch 600# tape peel off.			
	冲击 Impact test	50kgcm球冲击，观察涂层开裂状况 After rapidly deforming by 50kgcm impact. Examine the impacted area for cracking			
评判标准 Jadgement	★ 良好 No tape off		X 大量脱落 tape off heavily		
二次附着力* Wet adhesion	试样置于沸水中煮沸2小时后按一次附着力方法进行性能检测 Panel is dipped into boiling water for 2 hours, then tested its adhesion with the way metioned above				

涂层耐蚀性
Corrosion-resistance

耐蚀性试验 Corrosion-resistance test	冰箱侧板用 冷轧板 Cold rolled sheet used for side cover of the refrigerator	洗衣机外围用 电镀锌板 Electro-galvanized sheet for casing of the washing machine	空调室外机用 热镀锌板 Hot-dip galvanized sheet for outdoor-mounted set for air conditioner	空调室外机用 热镀锌铁合金板 Galvannealed sheet for outdoor mounted set for air conditioner
SST 500h (cross-cut)				

500 小时盐雾试验后的抗膜下腐蚀性能（ASTM B117）
The cosmetic corrosion-resistance of various steel sheets (ASTM B117, SST 500h)

Enviromentally Friendly Products

家电用环保系列产品介绍

环保产品种类 Environment-friendly products	基板 Base sheet	后处理方式 Surface treatment	后处理代码 Symbol
热镀锌钝化 Passivation hot-dip galvanized steel	热镀锌 Hot-dip galvanized	无铬钝化 Cr-free passivation	C5
		无铬钝化涂油 Cr-free passivation+oiling	CO5
热镀锌耐指纹 Anti-fingerprinting hot-galvanized steel		无铬耐指纹 Cr-free anti-fingerprint	N5
热镀铝锌钝化 Passivation 55% Al-Zn alloy coated steel	热镀铝锌 55% Al-Zn alloy coated	无铬钝化 Cr-free passivation	C5
热镀铝锌耐指纹 Anti-fingerprinting 55% Al-Zn alloy coated sheet		无铬耐指纹 Cr-free anti-fingerprint	N5
电镀锌钝化 Passivation electro-galvanized	电镀锌 Electro-galvanized	无铬钝化 Cr-free passivation	C5
电镀锌耐指纹 Anti-fingerprinting electro-galvanized steel		无铬耐指纹 Cr-free anti-fingerprint	N5
电镀锌磷化封闭 Phosphated+Cr-free sealed electro-galvanized		无铬磷化封闭 Phosphated+Cr-free sealed	P5
		无铬磷化封闭涂油 Phosphated+Cr-free sealed+oiling	PO5
彩涂 Color coated steel	热镀锌、热镀铝锌、电镀锌、冷轧 Hot-dip galvanized, 55% Al-Zn alloy coated, Electro-galvanized, cold-rolled		
K1/K2涂层电工钢 K1/K2 coating silicon steel	电工钢 Silicon steel	K1／K2涂层 K1/K2 coating	K

- 一流的企业为社会提供的不仅仅是优质的产品和服务，更应该从环境、能源角度关爱自己赖以生存的地球。“环境友好型产品”的概念正是基于这种背景提出的，全球的不同地区和国家已纷纷出台了许多法律法规来倡导使用环境友好型产品，同时限制甚至禁止非环境友好产品的使用。其中与电器及电子设备产品密切相关的是欧盟2002/95/EC公布的RoHS(Restriction of Hazardous Substances) 指令，禁用/限制对象为铅Pb、镉Cd、六价铬Cr(VI)、汞Hg以及两种有机阻燃剂PBDE及PBB，其中Pb<1000ppm、Cd<100ppm、Cr<1000ppm，其他禁用。

- 作为碳钢基材自身并不含RoHS指令所限用的有害元素，但在根据终端需求对钢板进行了各类表面处理后，其金属镀层及非金属涂层中可能含一种或多种有害元素。例如带锌花的热镀锌锌层中含Pb，传统的镀锌表面处理钢板（如钝化板、有机薄膜型耐指纹钢板或磷化封闭钢板）含Cr^{6+}，彩板预处理和涂料中含Cr^{6+}、Pb，电工钢绝缘涂层中含Cr^{6+}。Pb和Cr^{6+}属于环境污染因素的化学物质，在欧美已明确限制或禁止使用。

  宝钢基于“绿色制造、制造绿色”的理念，通过改进传统的生产工艺，目前在生产过程中已做到主辅原料“无人为添加有害元素”，实现了钢板生产和最终产品的环保化，品种主要涉及家电用钢中的镀锌板、彩涂板及电工钢。

- Besides providing the society with value-added product and service, as a first-class enterprise, it should attach more importance to environmental protection and saving resources and energy for the earth we are living. The concept of "environment-friendly product" coming up based on this background, many countries and regions in the world have established laws and rules calling for using environment-friendly product, even prohibiting non-environment-friendly product. The RoHS (restriction of hazardous substances) directive 2002/95/EC of European union restricts using lead (Pb), hexavalent chromium (Cr VI), cadmium (Cd), mercury (Hg) and polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE) in electrical and electronic equipment, among which Pb<1000ppm, Cd<100ppm, Cr<1000ppm, others are prohibited.

- There's no such hazardous element restricted by RoHS in carbon steel itself, but after surface treatment on carbon steel maybe there are one or more hazardous elements existing in metal coating or non-metal coating. For example, there's Pb existing in hot dip galvanized coating with spangle, Cr^{6+} existing in steel sheet with traditional surface treatment (chromated steel, anti-fingerprint steel sheet or phosphate treatment including chromate sealed steel sheet), there are Cr^{6+}, Pb existing in color coated steel sheet and coating, Cr^{6+} existing in insulated coating of silicon steel. Cr^{6+} and Pb are hazardous substandes which pollute environment, have been restricted or prohibited in the occident.

  Based on "green manufacture, manufacture greeny" concept, Baosteel has achieved "no man-made adding hazardous elements" in raw material during producing process through improving traditional producing technic, achieved environment-friendly on steel sheet producing and finished products, mainly concerns galvanized steel sheet, color coated steel sheet and silicon steel for home appliance.

Cr-free passivation and anti-fingerprinting hot-dip galvanized steel sheet

热镀锌无铬钝化及耐指纹钢板

热镀锌无铬钝化板

热镀锌无铬钝化钢板是将特殊造膜性有机物和添加剂组成的无铬处理剂和锌层表面反应形成钝化态薄膜，以取代传统的铬酸盐钝化膜，延缓钢板表面产生白锈的时间，赋予产品优秀的裸露耐蚀性。

热镀锌无铬耐指纹钢板

热镀锌无铬耐指纹钢板是一种表面涂覆有机薄膜(完全不含 Cr) 的高附加值产品,具有优良的耐蚀性、耐指纹性、导电性（接地性）和涂装性等。

上述产品适用于高档电脑机箱、OA 和 AV 器材的壳体及底板、家用电器及同类产品的内板。

Cr-free passivation hot-dip galvanized steel sheet

Cr-free passivation hot-dip galvanized steel sheet is designed to retard corrosion by an organic composite film with an advanced barrier property and an inorganic rust-preventive additive with a self-healing property in the organic film, replacing traditional chromate conversion coating. It is widely used as a low-cost rust-preventive process for suppressing white rust of Zn.

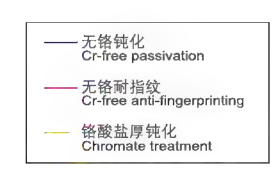
Cr-free anti-fingerprinting hot-dip galvanized steel sheet

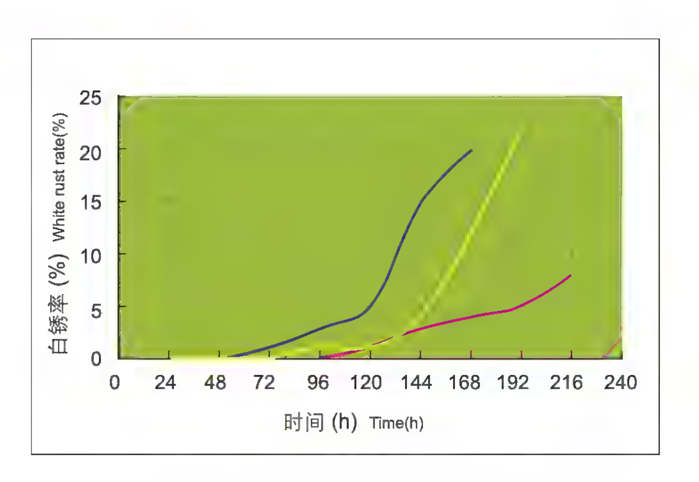
Cr-free anti-fingerprinting hot-dip galvanized steel sheet is a high added-value product with organic resin coating film (no-chromate absolutely) on the substrate, has good multipe functions including corrosion resistance, anti-fingerprinting property, electrical conductivity (grounding property) and paintability.

Above-mention product is applied to high grade computer cabinet casing, the chassis and bottom plates of OA and AV equipment, internal plates of home appliances and similar products.

- **不同表面处理热镀锌钢板的平板耐蚀性实例 (ASTM B117 盐雾试验)**

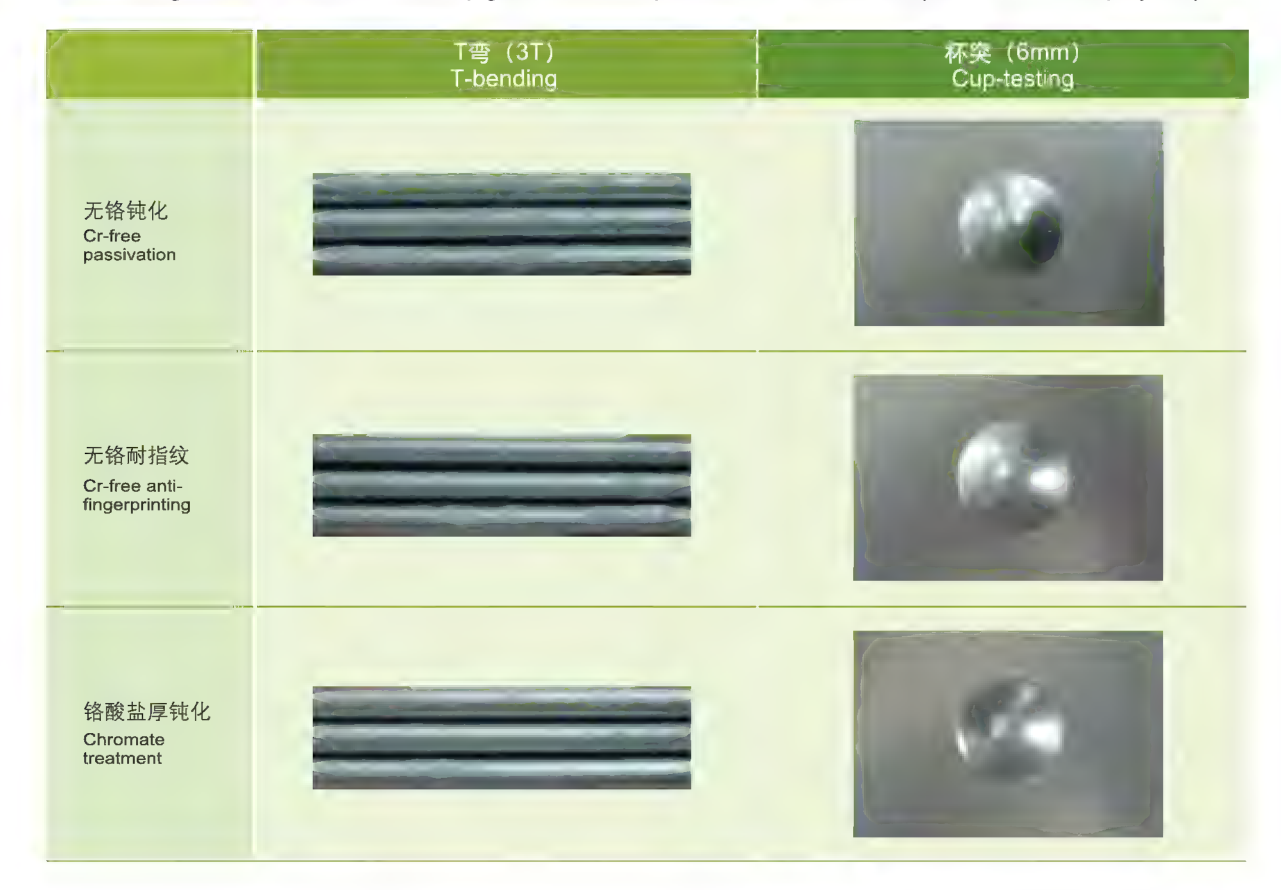
Different surface treatment of hot-dip galvanized sheet plate corrosion resistance
(ASTM B117 salt spray test)





- **不同表面处理热镀锌钢板成型后耐蚀性实例 (ASTM B117 盐雾试验)**

Affter forming, different treatment of hot-dip galvanized steel plate corrosion resistance (ASTM B117 salt spray test)



	T弯（3T） T-bending	杯突（6mm） Cup-testing
无铬钝化 Cr-free passivation		
无铬耐指纹 Cr-free anti-fingerprinting		
铬酸盐厚钝化 Chromate treatment		

Cr-free passivation and anti-fingerprinting hot-dip galvanized steel sheet | 热镀锌无铬钝化及耐指纹钢板

接地性

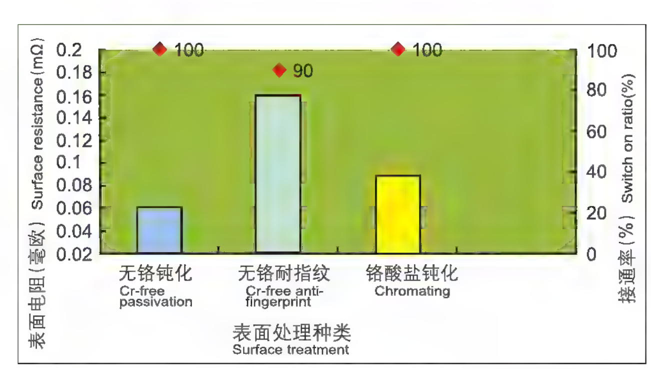
Grounding property

LORESTA-EP MCP-T360 低阻抗分析仪 / Low conductivity analyze instrument

评价 / Evaluate :

$$接通率 / Switch on ratio(\%) = \frac{接通次数 / switch on time}{20(次)} \times 100\%$$

接通 / Switch on = 表面电阻 / Surface resistance <1mΩ



耐碱性 — 碱洗后耐蚀性

Corrosion resistance after alkaline degreasing

碱性脱脂 / Alkali degreasing：

PARKERIZING FC-364S 脱脂剂

Spray 50°C× 2min

耐蚀性 / Corrosion Resistance： SST 72h

其他性能

Properties

注：◎ 优良 ○ 一般 X差

	耐湿热性 [illegible] Humidity resistance	耐热性* [illegible] Heat-resistance	耐指纹性 Anti-fingerprint	耐溶剂性（乙醇、丙酮）Solvent-resistance (Ethanol,Acetone)	涂装性 Coatability
无铬钝化 Cr-free passivation	◎	◎	◎	◎	○
无铬耐指纹 Cr-free anti-fingerprint	◎	◎	◎	◎	◎
铬酸盐钝化 Chromating	◎	◎	○	◎	○

注*：鉴于热镀锌无铬钝化和无铬耐指纹处理膜的特性，此类产品在经受高温（>250℃）的场合会变黄，故不推荐用于高温烘烤等用途的电器。

Attention*：Due to the characteristic of hot-dip galvanized Cr-free passivation and anti-fingerprinting steel sheet, the surface of this product will turn yellow in high temperature(>250℃), so not recommended for work in a state of high temperature appliances such as ovens, microwave ovens and so on.

● 热镀锌无铬钝化板的点焊性实例

The weldability of hot-dip galvanized Cr-free passivation (spot welding)

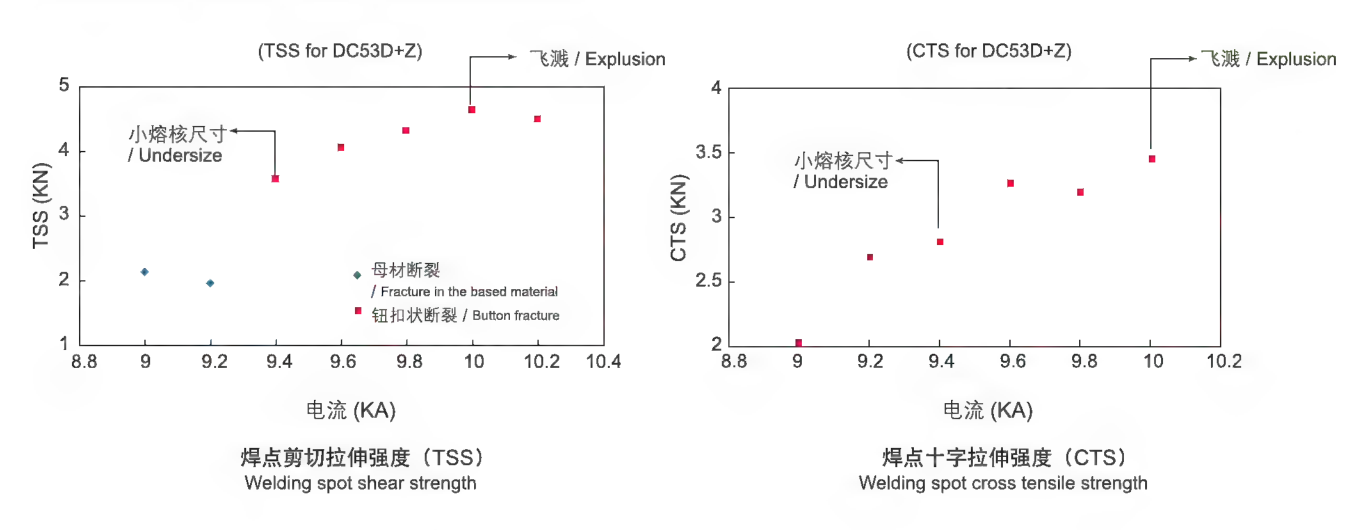
试样 Sample		点焊试验条件 Spot welding condition	
规格 Specification	DC53D+Z 0.8mm 厚	焊接电源型号 Power	D10-10 容量/Capacity 110KVA
		点焊控制器 Controller	Medweld 200s
		三段式电流 电阻点焊工艺 Multi-current	预热时间3周波 Preheating 3 cycle
锌层重量（g/m²） Coating weight	110/110		焊接时间11周波 Welding 11 cycle
			热处理时间4周波 Heat treating 4 cycle
表面处理 Surface treatment	无铬钝化 Cr-free passivation		保载时间1周波 Holding 1 cycle
		电极 Electrode	圆屋顶形 Φ6mm Dome-shaped
		电极压力 Force	1.65 KN

点焊性能：最小焊接电流 -9.4 KA; 最大焊接电流 (飞溅门槛值)-10.0 KA; 可焊电流范围 -0.6 KA

Weldability: Minimum current-9.4KA; maximun current (sputter threshold)-10.0KA; welding current scope-0.6KA.

● 可焊电流范围区间及附近的焊点静态力学性能

Welding current scope and static mechanical properties



焊点剪切拉伸强度（TSS）
Welding spot shear strength

焊点十字拉伸强度（CTS）
Welding spot cross tensile strength

Cr-free passivation and anti-fingerprinting 55% Al-Zn alloy coated sheet

热镀铝锌无铬钝化及耐指纹钢板

- 热镀铝锌生产线生产铝锌合金(55%Al—43.4%Zn—1.6%Si)钢板具备出色的耐大气腐蚀性能和外观，除应用于高档建筑外板以外，钝化或耐指纹膜处理的镀铝锌钢板在家电行业的使用量正在逐步上升。

热镀铝锌无铬耐指纹钢板或无铬钝化钢板，适合用作冰箱、空调后背板或内部其他结构件等，该产品锌花均匀美观，耐蚀性优良，使用时与发泡性粘结剂的附着力良好。

专用于各种显示器防爆带钢的热镀铝锌无铬钝化钢板除了具有良好耐蚀性以外，焊接(凸/点焊)性能、耐高热等使用特性优良，与当前热套式防爆带钢生产工艺相适应。

- 55% Al-Zn alloy coated steel sheet has excellent weather-proof property and appearance. In addition to the plate for top grade building outside, the volume of 55% Al-Zn alloy coated sheet with Cr-free passivation and anti-fingerprinting treatment used in home appliaance is getting bigger and bigger.

Cr-free passivation and anti-fingerprinting 55% Al-Zn alloy coated sheet are applicable to rear back panel for refrigerator and air conditioner or ther internal structural parts. This kind of product has even beautiful spangle, with excellent corrosion resistance property and good adhesion with foaming adhesive.

Specially used in explosion-proof band for CRT, the Cr-free passivation 55% Al-Zn alloy coated sheet has excellent corrosion resistance property, weldability, heat resistance property. It is suitable for current process of CRT.

- **热镀铝锌无铬耐指纹板性能**

The properties of Cr-free anti-fingerprinting 55% Al-Zn alloy coated sheet

耐盐雾性能（ASTM B117） Salty-spray resistance property	耐黑变性 （湿热促进试验法 70℃ × 90%RH × 120h后测定色差ΔE Blacken-resistance After humidity test (70℃ × 90%RH) 120h, measure the color difference(ΔE)
SST 120h （黑锈/Black rust<10%）	ΔE < 2.0 肉眼观察无明显变色 No significant change visually

耐指纹性 Anti-fingerprinting	发泡性 Adhesion	耐高温性 (220℃ × 1h) Heat-resistance	耐溶剂性 Solvent-resistance		抗擦伤性 Anti-scratching
			乙醇 Ethanol	MEK	
◎	◎	◎	○	○	○

注：◎ 优秀 Excellent ○ 一般 Common × 差 Bad

- **热镀铝锌无铬钝化板性能**

The properties of Cr-free passivation 55% Al-Zn alloy coated sheet

耐蚀性（SST） ASTM B117试验标准 Corrosion-resistance	耐湿热性/Humidity-resistance （49℃、RH>95%） ASTM D-1748试验标准	耐热性/Heat resistance （200℃ × 5min） （肉眼观察/Visually）	发泡性 Adhesion	[illegible] Coatability
≥ 72h (黑锈/Black rust < 10%)	240h (黑锈/Black rust < 10%)	外观不变色 No significant change	良好 Good	良好 Good

Cr-free anti-fingerprinting electro-galvanized sheet

电镀锌无铬耐指纹钢板 (SECC-N5)

电镀锌耐指纹板

电镀锌耐指纹板是一种表面涂覆有机薄膜、综合性能优良的高附加值产品，通过膜中有机树脂和添加剂的变化赋予了钢板表面各种功能，例如耐蚀、耐指纹、涂装、接地、润滑和抗划伤等性能。电镀锌耐指纹板广泛应用于电脑机箱、OA 和影视器材、微电机等领域。

Anti-fingerprinting electro-galvanized sheet

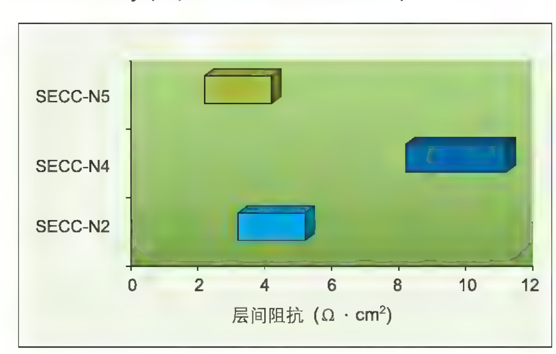
Anti-fingerprinting electro-glanvanized sheet, coated with an organic film, is a high value-added product. The sheet surface can be made to different specific function by regulating the organic resin and additives in the coating, it is generally of performance as corrosion resistance, fingerprint-proof, paintability, electrical conductivity, lubricating and among others. It is widely used in computer cabinet, OA products, micro-motor and other electronic fields.

电镀锌无铬耐指纹（SECC—N5）与原非环保（SECC—N2 或 SECC—N4）的性能对比

The characteristics of Cr-free anti-fingerprinting electro-galvanized (SECC-N5) (com pared with traditional product SECC-N2 / SECC-N4)

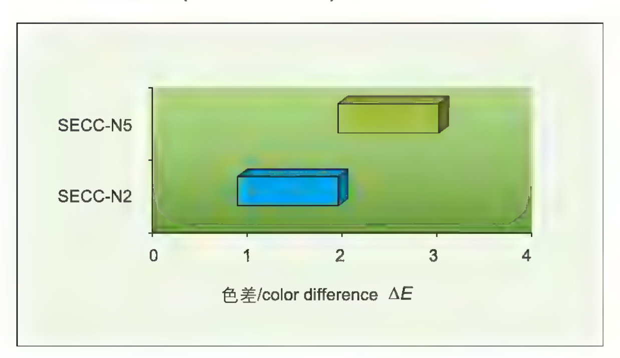
导电性（层间阻抗试验法 JISC2550）

Conductivity (impedance test JISC2550)



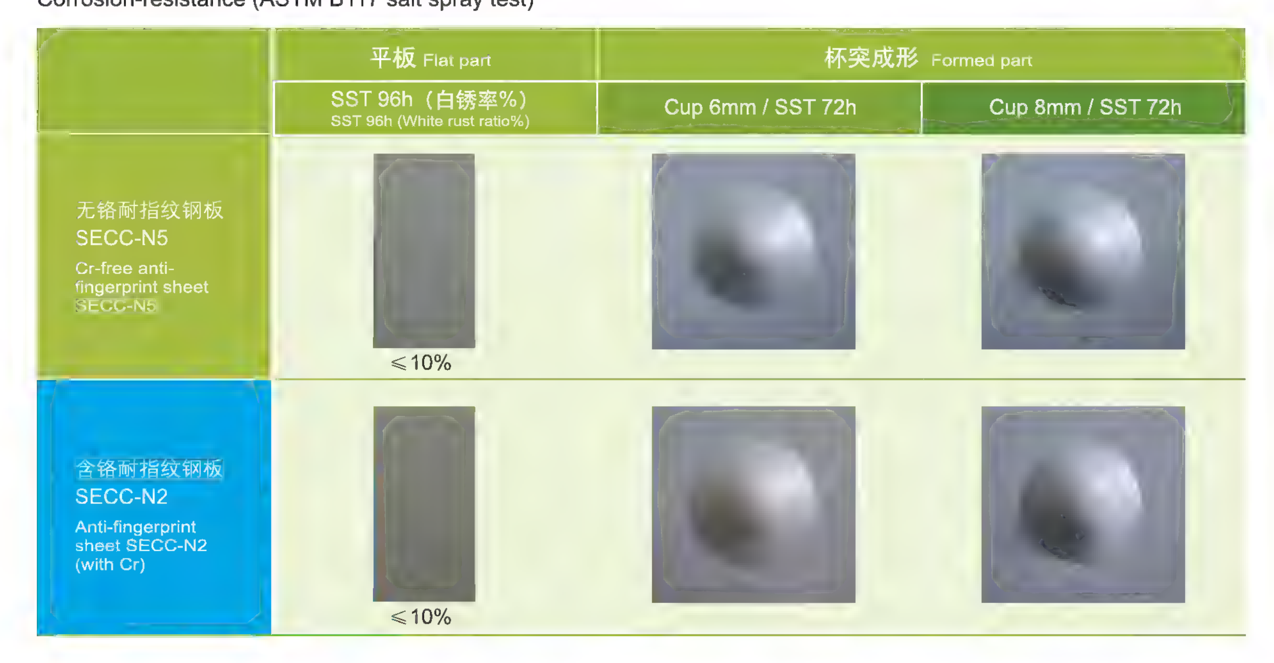
耐热性（180℃ ×30min）

Heat resistance (180℃ ×30min)



耐蚀性（ASTM B117 盐雾试验）

Corrosion-resistance (ASTM B117 salt spray test)



	平板 Flat part	杯突成形 Formed part	
	SST 96h（白锈率%） SST 96h (White rust ratio%)	Cup 6mm / SST 72h	Cup 8mm / SST 72h
无铬耐指纹钢板 SECC-N5 Cr-free anti-fingerprint sheet SECC-N5	≤10%		
含铬耐指纹钢板 SECC-N2 Anti-fingerprint sheet SECC-N2 (with Cr)	≤10%		

其他性能

Other properties

	[illegible] Anti-fingerprint	[illegible] Paintability	[illegible] Alkali-resistance	耐溶剂性 Solvent-resistance	耐黑变[illegible] Blacken-resistance	抗划伤性 Anti-scratch
SECC-N2	◎	◎	○	○	◎	○
SECC-N5	◎	◎	◎	◎	◎	◎

注：◎ 优秀 Excellent ○ 一般 Common

Phosphating with Cr-free sealed electro-galvanized sheet | 电镀锌无铬封闭磷化钢板 (SECC-P5)

电镀锌无铬封闭磷化板

电镀锌无铬封闭磷化板是在镀锌表面先作磷化处理，然后再经无铬钝化剂封闭，以覆盖漏磷点，进一步提高磷化膜的耐蚀性。该产品表面均匀致密的磷化膜与有机涂料的附着牢固，因磷化膜具有良好的抗碱性，钢板加工后通过普通脱脂除去表面油污，直接喷涂便可获得出色的涂装性。

该产品主要适合用作空调、洗衣机外板等。

Electro-galvanized phosphating with Cr-free sealed sheet

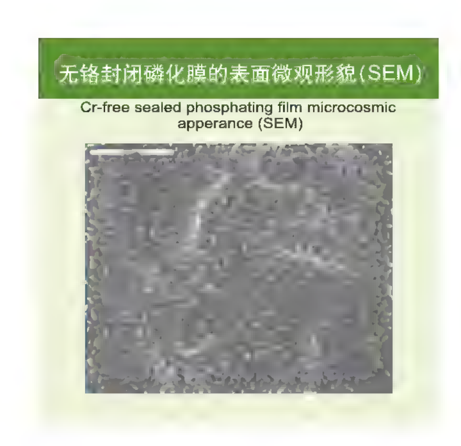
The Cr-free sealing treatment that takes place after phosphating are applied on electro-galvanized to cover the micro unphosphated spot, to better improve the corrosion resistance of phosphating film.

The unifrom dense phosphate film can adhere firmly with organic coating. Because the phosphating film has good alkali-resistance, the formed steel sheet can directly be coated after general degreasing.

This product is mainly suitable for body panel for air-conditioner, washing machine, etc.

耐蚀性
Corrosion resistance

	磷化+无铬封闭（磷化膜重1.9g/m^2） Phosphating+ Cr-free sealed	磷化+铬酸盐封闭（磷化膜重1.6g/m^2） Phosphating+ chromate sealed
耐蚀性（48h） Corrosion-resistance (48H)		



无铬封闭磷化膜的表面微观形貌(SEM)
Cr-free sealed phosphating film microcosmic apperance (SEM)

● 涂装性
Paintablilty

静电粉末喷涂 聚酯	Electrostatic powder paint polyester
固化条件 180°C×15min	Curing condition 180°C×15min
漆膜厚度 50±5μm	Coating film thickness 50±5μm

检测项目 Electro-galvanized		表面处理种类 Surface treatment	
		磷化＋无铬封闭 Phosphating + Cr-free sealed	磷化＋铬酸盐封闭 Phosphating + chromate sealed
一次附着力 Adhesion	划格 Cross hatch tape test	★	★
	冲击 Impact test	★	★
二次附着力 Wet adhesion	划格 Cross hatch tape test	★	★
	冲击 Impact test	★	★
抗膜下腐蚀性能（SST240h） Cosmetic corrosion resistance (SST240h)		切口气泡平均宽度＜2.0mm Average blister width < 2.0mm	切口气泡平均宽度＜2.0mm Average blister width < 2.0mm
试验方法 Testing		划格：1mm间隔地划100个正方形成棋盘格，Scotch600#胶带剥离。 冲击：50kgcm球冲击，Scotch600#胶带剥离。 抗膜下腐蚀：SST240h，cross-cut划线膜下腐蚀的平均蔓延宽度mm（单边）。 Cross hatch tape test: Make the cross hatch cut with the sharp cutting tool. The number of lines in each direction are II and the spacing between lines is 1mm. Scotch 600# tape peel off. Impact test: 50Kg cm ball impact test, Scotch 600# tape peel off. Corrosion resistance test: After SST 240h, evaluate scribe line creepback by measuring the blister width on each side of the scribe line.	
评价 Evaluate		★：漆膜无剥落 Coating film no peel	▲：漆膜少量剥落 Coating film peel a little

Electro-galvanized Cr-free chromating sheet | 电镀锌无铬钝化钢板 (SECC-C5)

● 电镀锌无铬钝化钢板

电镀锌无铬钝化钢板表面直接采用专用无铬钝化剂处理，有效地延缓了镀锌表面出现白锈的时间，使裸露使用的钢材具有长久耐蚀性，并有一定的耐指纹性。

产品推荐用于家用电器的内部结构件。

○ Cr-free passivation electro-galvanized sheet

The electro-galvanized sheet treated with special chromate free passivation showed very good resistance to white rust corrosion, so that the use of the bare electro-galvanized steel with long-term corrosion resistance. At the same time it has a certain resistance of fingerprint.

This product is applicable to internal structure panel for home appliance.

● 耐蚀性（ASTM B117 盐雾试验）

Corrosion resistance (ASTM B117 salt spray test)

	EG 无铬钝化 EG Cr-free passivation
耐蚀性（SST 48h） Corrosion-resistance (SST 48h)	

● 涂装性

Paintability

静电粉末喷涂 聚酯	Electrostatic powder paint polyester
固化条件 180°C×15min	Curing condition 180°C×15min
漆膜厚度 40±5μm	Coating film thickness 50±5μm

涂层附着性 Adhesion			抗膜下腐蚀性能（SST 240h） Cosmetic corrosion-resistance test (SST240h)
一次附着力 Adhesion	划格 Cross hatch tape test	★	切口平均气泡宽度＜2.0mm Average blister width < 2 0mm
	冲击 Impact test	★	
二次附着力 Wet adhesion	划格 Cross hatch tape test	★	
	冲击 Impact test	★	
试验方法 Testing	划格：1mm间隔地划100个正方形成棋盘格，Scotch600#胶带剥离。冲击：50kgcm球冲击，Scotch600#胶带剥离。抗膜下腐蚀：SST240h，cross-cut 划线膜下腐蚀的平均蔓延宽度mm（单边） Cross hatch tape test: Make the cross hatch cut with the sharp cutting tool. The number of lines in each direction are II and the spacing between lines is 1mm Scotch 600# tape peel off. Impact test: 50Kgcm ball impact test, Scotch 600# tape peel off.		
评价 Evaluate	★：漆膜无剥落 Coating film no peel ▲：漆膜少量剥落 Coating film peel a little		

点焊性实例
Weldability (Spot welding)

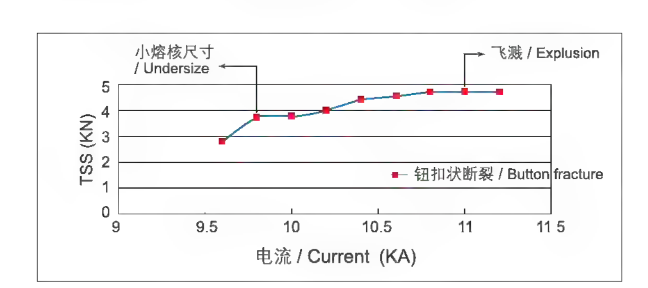
点焊性能：最小焊接电流 9.8 KA；
最大焊接电流 (飞溅门槛值)11.0 KA
可焊电流范围 1.2 KA

Weldability: Minimum current 9.8KA
maximun current (sputter threshold)
11.0KA current scope 1.2KA

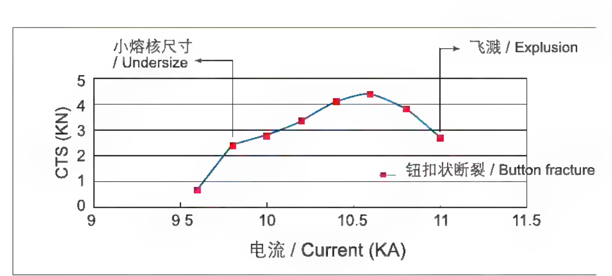
试样 Sample	
规格 Specification	BLDE+Z 0.8mm 厚
锌层重量（g/m²） Coating weight	20/20
表面处理 Surface treatment	无铬钝化 Cr-free passivation

点焊试验条件 Spot welding qualification	
焊接电源型号 Power	D10-10 容量110KVA
点焊控制器 Controller	Medweld 200s
三段式电流 电阻点焊工艺 Multi-current	预热时间3周波 Preheating 3 cycle
	焊接时间12周波 Welding 12 cycle
	热处理时间4周波 Heat treating 4 cycle
	保载时间1周波 Holding 1 cycle
电极 Electrode	圆屋顶形 Φ6mm Dome-shaped
电极压力 Force	1.8 KN

可焊电流范围区间及附近的焊点静态力学性能
Welding current scope and static mechanical properties nearby



BLDE+Z 焊点剪切拉伸强度（TSS）
Welding spot shear strength



BLDE+Z 焊点十字拉伸强度（CTS）
Welding spot cross tensile strength

Environment friendly color-coated sheet for home applicance | 环保家电彩色涂层钢板

家电用环保彩色涂层钢板

家电环保彩色涂层钢板由无铅镀锌层 + 无铬预处理 + 环保底、面涂构成，是由里到外的环保彩涂产品。

可直接加工成家电产品面板，帮助用户省略脱脂 - 磷化 - 喷漆 - 烘烤等涂装处理工序，降低用户成本，减除用户制造家电过程中的污染源，使家电生产绿色化。

根据具体需求，可提供多种颜色 (包括金属色)、多种表面效果的产品。

适合于空调 (室内、室外机)、冰箱、微波炉、DVD、热水器等。

Environment friendly color-coated sheet for home applicance

Environment friendly color-coated sheet for home applicance is composed of lead free, Cr-free pretreatment, environment friendly primer and top coat, it is environment friendly color-coated sheet from inside to outside.

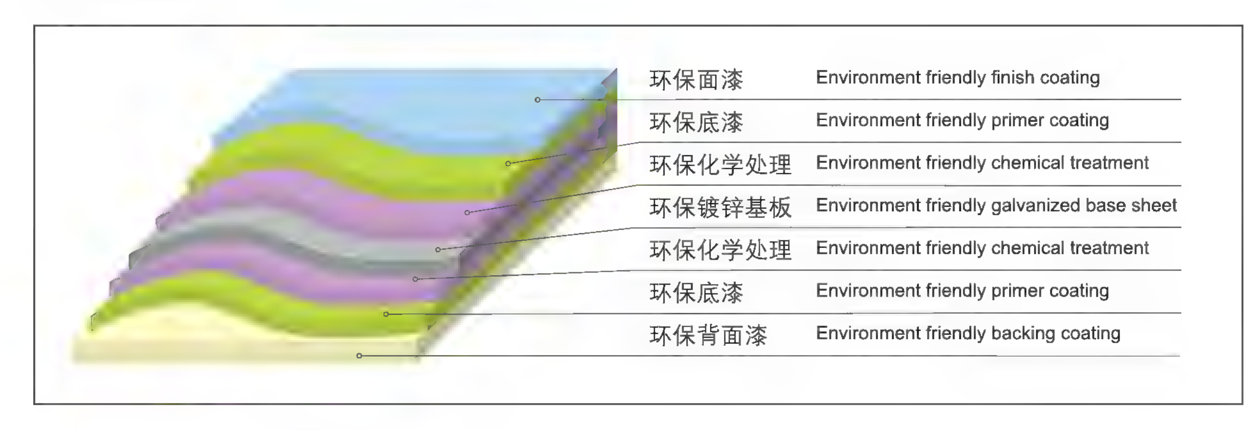
It can be directly to make home applicance products panel, help the enduser saving the degreasing-phosphating-coating-curing and other process, decreasing cost, reducing contaminated source, to make home appliance product greeny.

We can provide different colour (including metal colour), a variety of surface effects of products depends on customer's demand.

It is applicable to air conditioner (indoor, outdoor) panel, refigerator, microwave oven, DVD, water heater, etc.

环保彩板结构示意图

Film construction



● 产品综合性能（以空调室外机用板为例，与竞争对手同类产品对比）

Product general property (take air conditioner outdoor panel for example, compared with same kind products from competitors)

项目 Item	试验方法 Testing	产品要求 Product requirement	宝钢产品 Baosteel product	其他厂家1产品 Other producer's product 1	其他厂家2产品 Other producer's product 1
基板品种 Base sheet		SGCD2或相当 SGCD2 or equivalent	SGCD2或相当 SGCD2 or equivalent	SGCD2或相当 SGCD2 or equivalent	SGCD2或相当 SGCD2 or equivalent
锌层重量 g/m^2 Coating weight		40/40 or 60/60	60/60	40/40	40/40
外观 Appearance	目视JIS K5400 7.1 JIS K5400 7.1	无杂质、气泡等有碍使用的缺陷 Free from such defects as inclusions, air bubble and other imperfections that are detrimental to practical use	良好 Good	良好 Good	良好 Good
膜厚（μm） Film thickness	破坏式膜厚计 Thickness measurement (damage)	正面/背面 Face / back	25/12	23/6	25/7
色差 Colour difference	目视 Visual	参考样板 Reference control panel	合格 Qualified	合格 Qualified	合格 Qualified
光泽 Gloss	JIS K5400 7.6	参考样板 Reference control panel	69	70	73
附着力 Adhesion	划格 Cross-cut	100/100	100/100	100/100	100/100
铅笔硬度 Pencil hardness	JIS K5400 8.4 (三菱铅笔 Mitsubishi pencil)	H以上	2H	H	H
耐冲击性 Impact resistance	JIS K5400 8.3.2 (1/2" × 500g)	漆膜无裂纹 Crack-free	50cm OK	50cm OK	50cm OK
弯曲 Bend	0℃ 2T	目视漆膜无裂纹 Visual crack-free	无 Crack-free	无 Crack-free	无 Crack-free
	常温 0T Genenal temperature		无 Crack-free	无 Crack-free	无 Crack-free
杯突(7mm) Cup	JIS K5400 8.2	漆膜无裂纹 Crack-free	无 Crack free	无 Crack free	无 Crack free
耐湿热性 Humidity resistance	40℃ × 98%RH × 240h	漆膜无异常 No abnormity	正常 OK	正常 OK	正常 OK
耐蚀性 Corrosion resistance	盐雾试验 240h Salt spray test 240h	切口扩蚀宽度 Cutting extend rot width	0-1mm	0-3mm	0-3mm
		端面扩蚀宽度 End extend rot width	0-5mm	0-5mm	0-5mm
耐候性 Weatherability	DEW试验120h DEW test 120h	色差≤2.5 Colour difference	2.4	2.1	1.7
		残存光泽率≥75% The remanent of gloss	81	106	84
耐擦伤性 Anti-scractch	食指和中指缠绕纱布在50cm范围的往复摩擦10次 Winding index finger and middle finger in gauze 50 cm of reciprocating friction 10	无摩擦痕迹 No signs of friction	无 No	无 No	无 No

Environment friendly electrical steel | 环保电工钢产品

环保电工钢产品

目前宝钢使用的电工钢环保涂料系有机 / 无机混合的水溶性涂料，根据涂层特性可分为K1和K2两种，涂层中不含 Cr^{6+}，满足欧盟 RoSH 指令对家电产品的要求。

此类环保电工钢可适用于变压器、中小电机、空调压缩机、冰箱压缩机等的铁芯制造。

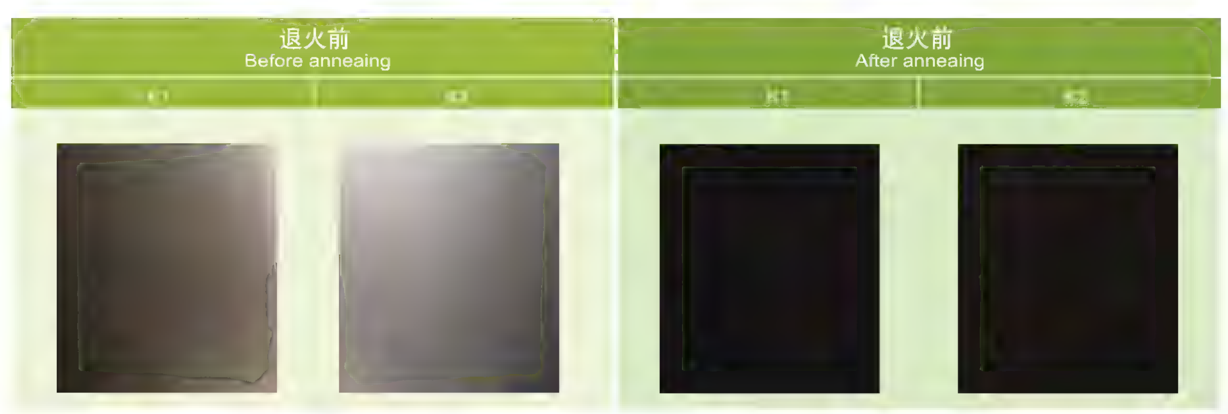
Environment friendly electrical steel

Baosteel's Environment friendly electrical steel coating is organic/inorganic mixed water-solubility coating, the coating can be divided into K1 & K2 according to coating characteristic, free from Cr6+, meet the EU RoSH directive's requirement on home appliance product.

This product is applicable to manufacture various cores for transformer, mediun & small electric motors, air conditionere compressor, refrigerator compressor etc.

退火前后的外观实例

Appearance samples before and after anneaing



- **产品综合性能（以空调室外机用板为例，与竞争对手同类产品对比）**
  Product general property (take air conditioner outdoor panel for example, compared with same kind products from competitors)

涂层代码 Coating symbol	A	H	K	
涂层种类 Coating type	半有机 Semi-organic	半有机 Semi-organic	半有机 I Semi-organic I	半有机 II Semi-organic II
组成 Compose	以无机为主，含有机树脂 Inorganic mainly organic resin included	以无机为主，含有机树脂 Inorganic mainly organic resin included	以无机为主，含有机树脂 Inorganic mainly organic resin included	以无机为主，含有机树脂 Inorganic mainly organic resin included
适用范围 Applicable field	焊接性要求高，冲片性要求高，需要消除应力退火的场合 The field with high welding requirement, high punching requirement, need to eliminate stress by annealing	冲片性要求特别高，绝缘性要求高，焊接性要求一般，不需要消除应力退火的场合 The field with very high punching requirement, high insulati, general welding requirement, do not need to eliminate stress by annealing	冲片性要求特别高，绝缘性要求高，焊接性要求一般的场合 The field with very high punching requirement, high insulati, general welding requirement	焊接性要求高，冲片性要求较高，需要消除应力退火的场合 The field with high welding requirement, high punching requirement, need to eliminate stress by annealing
附着性 Adhesion	极为优异 Very excellent	优异 Excellent	非常优异 Very excellent	非常优异 Very excellent
冲片性 Punching property	极为优异 Very excellent	非常优异 Very excellent	极为优异 Very excellent	优异 Very excellent
焊接性 Weldability	优良 Good	一般 General	一般 General	优良 Good
耐蚀性 Corrosion-resistance	优良 Good	极为优异 Very excellent	优异 Excellent	极为优异 Very excellent
耐热性 Heat resisitance	在非氧化性气氛中耐最高温度约800℃的消除应力退火 800℃ heat resistance in inoxidate atmosphere, eliminating stress by annealing	不适于消除应力退火 Inapplicable to eliminate stress by annealing	在非氧化性气氛中耐最高温度约750℃的消除应力退火 750℃ heat resistance in inoxidate atmosphere, eliminating stress by annealing	在非氧化性气氛中耐最高温度约750℃的消除应力退火 750℃ heat resistance in inoxidate atmosphere, eliminating stress by annealing
耐冷冻性 Cold resistance	耐氟利昂R22、R134a无变化 Freon resistance R22, R134a without change	耐氟利昂R22、R134a无变化 Freon resistance R22, R134a without change	耐氟利昂R22、R134a无变化 Freon resistance R22, R134a without change	
层间电阻 Surface resistance	较高 Higher	高 High	高 High	高 High
叠片系数 Stack coefficient	极高 Very high	极高 Very high	极高 Very high	极高 Very high
环保情况 Environment-friendly	涂层中含有极微量的Cr^{6+} Small amount of Cr^{6+}	涂层中含有极微量的Cr^{6+} Small amount of Cr^{6+}	不含Cr^{6+} Cr^{6+} free	不含Cr^{6+} Cr^{6+} free

备注 :A: 含铬薄涂层　　H: 含铬厚涂层　　K: 无铬涂层
A:Cr thin coating　　H:Cr thick coating　　K: Cr-free coating

Baosteel's Environmental Statement

宝钢对环保家电产品的承诺

- 为更好地与宝钢的家电用户携手共同应对欧盟 RoHS 指令，宝钢开发了一系列无铬环保产品，形成了批量供货的能力。对于无铬环保产品宝钢可以出具承诺书和第三方检测报告，所供环保产品符合欧盟 RoHS 指令所限制使用的六项环境有害物质。

  附件 1、用户对产品承诺书的需求表
  附件 2、产品承诺书（样张）
  附件 3、第三方检测报告

  （用户需查询或下载宝钢其它产品的 SGS 报告，可以登陆宝钢在线 http://www.baosteel.net.cn)

- To better replying the EU RoHS directive associating with Baosteel's end users of home appliance products, we have developed a seriers of Cr-free environment friendly products, we can supply in large quantities. For Cr-free environment friendly products, we can supply promises in written and the third side testing report, our environment friendly products accord with EU RoHS directive, among with there are 6 hazardous substance prohibited.

  Annex 1 coustomer's requirement table for product promising in written

  Annex 2 product promising in written (samples)

  Annex 3 the third side testing report

- 热镀锌无铬钝化第三方检测报告

  热镀锌无铬耐指纹第三方检测报告

  电镀锌无铬耐指纹第三方检测报告

  无取向电工钢 K 涂层第三方检测报告

- Hot-dip galvanized Cr-free passivation third side testing report

  Hot-dip galvanized Cr-free anti-fingerprinting third side testing report

  Electro galvanized Cr-free anti-fingerprinting third side testing report

  Non-oriented electrical steel K coating third side testing report

TECHNICAL MANUAL
OF STEEL FOR APPLIANCE

附件一

用户对产品承诺书的需求表

用户名称：
产品名称：
用料情况（月需求量）：
产品流向（具体做什么部件）：
所要求符合的环保指令或法律法规：
用户企业环保规范要求（如果没有就不填）：
其他：

附件一

宝山钢铁股份有限公司
BAOSHAN IRON & STEEL CO., LTD.

产品承诺书（样张）

至:(用户)

宝山钢铁股份有限公司在理解欧盟 RoHS 指令以及(用户)技术规范要求的基础上,并根据 指令以及(用户)的技术规范要求对直接提供给贵公司的(宝钢单一产品)进行了核查,证实产品符合相关规范。(注:用户无特殊要求用斜杠表示)

宝山钢铁股份有限公司根据欧盟 94/62/EC(包装材料指令)对直接提供给贵公司的包装材料进行了核查,证实包装材料符合相关规范。(注:用户对包装无要求的,此段不写)

宝山钢铁股份有限公司在此承诺,本公司直接提供给贵公司的(宝钢单一产品),符合根据欧盟 RoHS 指令所禁止使用的六项环境有害物质。

铅及其化合物 — 限值 1000ppm

镉及其化合物 — 限值 100ppm

汞及其化合物 — 限值 1000ppm

六价铬及其化合物 — 限值 1000ppm

多溴联苯 — 限值 1000ppm

多溴联苯醚 — 限值 1000ppm

特此承诺。

公司授权人签字(盖章)

日期:

Test Report **No. SH8022454/ CHEM** Date: Mar. 20, 2008 Page 1 of 5

公司名称: 上海宝山钢铁股份有限公司
Company Name: SHANGHAI BAOSHAN IRON & STEEL CO., LTD
地址: 上海同济路 1800 号
Address: 6/F, 1800 TONGJI RD, BAOSHAN, SHANGHAI, CHINA

样品名称: 电镀锌耐指纹
TYPE OF PRODUCT: CONTINUOUSLY ELECTROLYTIC ZINC COATED STEEL,ANTIFINGER TREATMENT WITHOUT HEXAVALENT CHROMUM
SGS 相关号: 10869348-16
SGS Ref No.: 10869348-16

收件日期(SAMPLE RECEIVED). Feb 27, 2008; Mar.17, 2008
测试日期(TESTING DATE). Feb.27 – Mar.05, 2008; Mar.17 – 20, 2008

Test Requested/测试要求 : (1) To determine the Cadmium, Lead and Mercury content of the electroplating for submitted sample.
测定委托样品电镀层中镉, 铅, 汞的含量
(2) To determine the Hexavalent Chromium content of the electroplating for submitted sample.
测定委托样品电镀层中六价铬的含量
(3) To determine the PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid) content of the electroplating for submitted sample.
测定委托样品电镀层中全氟辛烷磺酰基化合物(PFOS) 和全氟辛酸(PFOA)的含量

试验方法/测试结果 : 见后续页
Test method/Test Results: Please refer to next page

Signed for and on behalf of
SGS-CSTC Chemical Laboratory

Ella Zhang
Section Manager

Signed for and on behalf of
SGS-CSTC Chemical Laboratory

Sandy Hao
Sandy Hao
Lab Manager

Test Report **No. SH8022454/ CHEM** Date: Mar. 20, 2008 Page 2 of 5

Test method/测试方法. : (1) Acid washing method for Cadmium, Lead and Mercury content in electroplating.
Analysis was performed by Inductively Coupled Argon Plasma-Atomic Emission Spectrometer (ICP-AES) and Atomic Absorption Spectrometer (AAS).
酸洗脱方法测定电镀层中的镉,铅和汞含量.
采用ICP和AAS进行分析
(2) With reference to IEC 62321/2nd CDV (111/95/CDV) for Hexavalent Chromium by spot test / Colorimetric Method.
参照 IEC 62321/2nd CDV (111/95/CDV), 采用点测试法/比色法测定六价铬的含量
(3) With reference to EPA 3550C: 2000.
Analysis was performed by High Performance Liquid Chromatograph-Mass Spectrometer (HPLC-MS).
参照 EPA 3550C: 2000 方法, 采用 HPLC-MS 测试.

Test results by chemical method
(1)-(2) Cadmium, Lead ,Mercury and Hexavalent Chromium content of the electroplating for submitted sample. (Unit: mg/kg)
样品电镀层中镉, 铅, 汞和六价铬的含量(单位: mg/kg)

Test Item(s)/ 测试项目	Method(refer to)/ 方法(参见)	1	MDL
Cadmium (Cd) in electroplating/ 电镀层中镉(Cd)	(1)	ND	10
Lead (Pb) in electroplating/ 电镀层中铅(Pb)	(1)	14	10
Mercury (Hg) in electroplating/ 电镀层中汞(Hg)	(1)	ND	10
Hexavalent Chromium (Cr VI)/ 六价铬(Cr VI)	(2)	Negative	See Note (4)/ 参见备注 (4)

SGS

Test Report No. SH8022454/ CHEM Date: Mar. 20, 2008 Page 3 of 5

(2) PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid) content of the electroplating for submitted sample (Unit: ug/m^2)
样品电镀层中全氟辛烷磺酰基化合物(PFOS) 和全氟辛酸(PFOA)的含量(单位: ug/m^2)

Test Item(s)/ 测试项目	Method(refer to)/ 方法(参见)	1	MDL
PFOS (Perfluorooctane Sulfonates) Σ { PFOS-acid, PFOS-salt } 全氟辛烷磺酰基化合物(PFOS) Σ { PFOS-酸, PFOS-盐 }	(1)	ND	1
PFOA(Perfluorooctanoic Acid) Σ { PFOA-acid, PFOA-salt } 全氟辛酸(PFOA) Σ { PFOA-酸, PFOA-盐 }		ND	1

Test Part Description:
1. Silvery-grey metal board

Test Report **No. SH8022454/ CHEM** Date: Mar. 20, 2008 Page 4 of 5

Note :

(1) mg/kg=ppm
毫克每千克=百万分之 (mg/kg=ppm)

(2) ND = Not detected
ND=未检出

(3) MDL = Method Detection Limit
MDL =检测极限值

(4) Spot-test:
Negative = Absence of CrVI coating, Positive = Presence of CrVI coating;
(The tested sample should be further verified by boiling-water-extraction method if the spot test result is Negative or cannot be confirmed.)
Boiling-water-extraction:
Negative = Absence of CrVI coating
Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm^2 sample surface area.
点测试法:
Negative= 镀层中未检测到六价铬, Positive = 镀层中检测到六价铬;
(当点测试结果为 Negative 或无法确定时,将采用沸水萃取法作进一步的结果验证。)
沸水萃取法:
Negative = 镀层中未检测到六价铬
Positive = 镀层中检测到六价铬; 表明 50 cm^2 表面积的被测试样品的沸水萃取液中六价铬的浓度等于或大于 0.02 mg/kg

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Test Report No. SH8022454/ CHEM Date: Mar. 20, 2008 Page 5 of 5

Sample photo:

SGS authenticate the photo on original report only

*** End of Report ***

Test Report **No. SH8022476-1/ CHEM** Date: Jun 4, 2008 Page 1 of 5

公司名称: 上海宝山钢铁股份有限公司
Company Name: SHANGHAI BAOSHAN IRON & STEEL CO., LTD
地址: 上海同济路 1800 号
Address: 6/F, 1800 TONGJI RD, BAOSHAN, SHANGHAI, CHINA

THIS REPORT IS TO SUPERSEDE TEST REPORT NO.SH8022476/CHEM DATE: 2008/03/20

样品名称: 热镀锌耐指纹
TYPE OF PRODUCT CONTINUOUSLY HOT-DIP ZINC COATED STEEL SHEET & STRIP ANTIFINGER TREATMENT WITHOUT HEXAVALENT CHROMUM
SGS 参考号: 10869348-27
SGS Ref No.: 10869348-27

收件日期(SAMPLE RECEIVED). Feb. 27, 2008
测试日期(TESTING DATE). Feb.27 to Mar.05, 2008;Mar.17-20,2008

Test Requested/测试要求:

(1) To determine the Cadmium, Lead and Mercury content of the plating for submitted sample.
测定委托样品镀层中镉, 铅, 汞的含量
(2) To determine the Hexavalent Chromium content of the plating for submitted sample
测定委托样品镀层中六价铬的含量
(3) To determine the PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid) content of the plating for submitted sample
测定委托样品镀层中全氟辛烷磺酰基化合物(PFOS) 和全氟辛酸(PFOA)的含量

试验方法/测试结果 ：见后续页
Test method/Test Results: Please refer to next page

Signed for and on behalf of
SGS-CSTC Chemical Laboratory

Ella Zhang
Section Manager

Signed for and on behalf of
SGS-CSTC Chemical Laboratory

Sandy Hao
Sandy Hao
Lab Manager

SGS

SGS

Test Report **No. SH8022476-1/ CHEM** Date: Jun. 4, 2008 Page 2 of 5

Test method/测试方法: (1) Acid washing method for Cadmium, Lead and Mercury content in plating. Analysis was performed by Inductively Coupled Argon Plasma-Atomic Emission Spectrometer (ICP-AES) and Atomic Absorption Spectrometer (AAS).
酸洗脱方法测定镀层中的镉,铅和汞含量
采用ICP和AAS进行分析

(2) With reference to IEC 62321/2^{nd} CDV (111/95/CDV) for Hexavalent Chromium by spot test / Colorimetric Method.
参照 IEC 62321/2^{nd} CDV (111/95/CDV), 采用点测试法/比色法测定六价铬的含量

(3) With reference to EPA 3550C. 2000.
Analysis was performed by High Performance Liquid Chromatograph-Mass Spectrometer (HPLC-MS).
参照 EPA 3550C: 2000 方法, 采用 HPLC-MS 测试.

Test results by chemical method

(1)-(2) Cadmium, Lead ,Mercury and Hexavalent Chromium content of the plating for submitted sample. (Unit mg/kg)
样品镀层中镉, 铅, 汞和六价铬的含量(单位: mg/kg)

Test Item(s)/ 测试项目	Method(refer to)/ 方法(参见)	1	MDL
Cadmium (Cd) in plating/ 镀层中镉(Cd)	(1)	ND	10
Lead (Pb) in plating/ 镀层中铅(Pb)		22	10
Mercury (Hg) in plating/ 镀层中汞(Hg)		ND	10
Hexavalent Chromium (Cr VI)/ 六价铬(Cr VI)	(2)	Negative	See Note (4)/ 参见备注 (4)

Test Report **No. SH8022476-1/ CHEM** Date: Jun 4, 2008 Page 3 of 5

(3) PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid) content of the plating for submitted sample (Unit: ug/m²)

样品镀层中全氟辛烷磺酰基化合物(PFOS) 和全氟辛酸(PFOA)的含量(单位: ug/m²)

Test Item(s)/ 测试项目	Method(refer to)/ 方法(参照)	1	MDL
PFOS (Perfluorooctane Sulfonates) $\Sigma \{$ PFOS-acid, PFOS-salt $\}$ 全氟辛烷磺酰基化合物(PFOS) $\Sigma \{$ PFOS-酸, PFOS-盐 $\}$	(3)	ND	1
PFOA(Perfluorooctanoic Acid) $\Sigma \{$ PFOA-acid, PFOA-salt $\}$ 全氟辛酸(PFOA) $\Sigma \{$ PFOA-酸, PFOA-盐 $\}$		ND	1

Test Part Description:

1. Silvery grey metal board

Test Report No. SH8022476-1/ CHEM Date: Jun. 4, 2008 Page 4 of 5

Note :

(1) mg/kg=ppm
毫克每千克=百万分之一(mg/kg=ppm)

(2) ND = Not detected
ND=未检出

(3) MDL = Method Detection Limit
MDL =检测极限值

(4) Spot-test:
Negative = Absence of CrVI coating, Positive = Presence of CrVI coating;
(The tested sample should be further verified by boiling-water-extraction method if the spot test result is Negative or cannot be confirmed.)
Boiling-water-extraction:
Negative = Absence of CrVI coating
Positive = Presence of CrVI coating, the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm^2 sample surface area.
点测试法:
Negative= 镀层中未检测到六价铬, Positive = 镀层中检测到六价铬;
(当点测试结果为 Negative 或无法确定时,将采用沸水萃取法作进一步的结果验证。)
沸水萃取法:
Negative = 镀层中未检测到六价铬
Positive = 镀层中检测到六价铬; 表明 50 cm^2 表面积的被测试样品的沸水萃取液中六价铬的浓度等于或大于 0.02 mg/kg

Test Report **No. SH8022476-1/ CHEM** Date: Jun. 4, 2008 Page 5 of 5

Sample photo:

SGS authenticate the photo on original report only

*** End of Report ***

Test Report **No. SH8022480-1/ CHEM** Date: Jun. 4, 2008

公司名称：上海宝山钢铁股份有限公司
Company Name: SHANGHAI BAOSHAN IRON & STEEL CO., LTD
地址：上海同济路 1800 号
Address: 6/F, 1800 TONGJI RD, BAOSHAN, SHANGHAI, CHINA

THIS REPORT IS TO SUPERSEDE TEST REPORT NO.SH8022480/CHEM DATE: 2008/03/20

样品名称：热镀锌无铬钝化涂油
TYPE OF PRODUCT: HOT-DIP ZINC COATED STEEL STRIP, CHEMICAL PASSIVATED WITHOUT HEXAVALENT CHROMIUM
SGS 相关号：10869348-29
SGS Ref No.: 10869348-29

收件日期(SAMPLE RECEIVED): Feb.27, 2008
测试日期(TESTING DATE): Feb.27 to Mar.05, 2008, Mar.17 to 20, 2008

Test Requested/测试要求

(1) To determine the Cadmium, Lead and Mercury content of the plating for submitted sample.
测定委托样品镀层中镉，铅，汞的含量
(2) To determine the Hexavalent Chromium content of the plating for submitted sample.
测定委托样品镀层中六价铬的含量
(3) To determine the PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid) content of the plating for submitted sample.
测定委托样品镀层中全氟辛烷磺酰基化合物(PFOS) 和全氟辛酸(PFOA)的含量

试验方法/测试结果 ：见后续页
Test method/Test Results: Please refer to next page

Signed for and on behalf of SGS-CSTC Chemical Laboratory	Signed for and on behalf of SGS-CSTC Chemical Laboratory
Ella Zhang	Sandy Hao
Section Manager	Lab Manager

Test Report **No. SH8022480-1/ CHEM** Date: Jun. 4, 2008 Page 2 of 5

Test method/测试方法:

(1) Acid washing method for Cadmium, Lead and Mercury content in plating
Analysis was performed by Inductively Coupled Argon Plasma-Atomic Emission Spectrometer (ICP-AES) and Atomic Absorption Spectrometer (AAS).
酸洗脱方法测定镀层中的镉,铅和汞含量.
采用ICP和AAS进行分析

(2) With reference to IEC 62321/2nd CDV (111/95/CDV) for Hexavalent Chromium by spot test / Colorimetric Method
参照 IEC 62321/2nd CDV (111/95/CDV), 采用点测试法/比色法测定六价铬的含量

(3) With reference to EPA 3550C: 2000.
Analysis was performed by High Performance Liquid Chromatograph-Mass Spectrometer (HPLC-MS)
参照 EPA 3550C: 2000 方法, 采用 HPLC-MS 测试.

Test results by chemical method

(1)-(2) Cadmium, Lead ,Mercury and Hexavalent Chromium content of the plating for submitted sample. (Unit: mg/kg)
样品镀层中镉, 铅, 汞和六价铬的含量(单位: mg/kg)

Test Item(s)/ 测试项目	Method(refer to)/ 方法(参见)	1	MDL
Cadmium (Cd) in plating/ 镀层中镉(Cd)	(1)	ND	10
Lead (Pb) in plating/ 镀层中铅(Pb)		17	10
Mercury (Hg) in plating/ 镀层中汞(Hg)		ND	10
Hexavalent Chromium (Cr VI)/ 六价铬(Cr VI)	(2)	Negative	See Note (4)/ 参见备注 (4)

Test Report **No. SH8022480-1/ CHEM** Date: Jun. 4, 2008

(3) PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid) content of the plating for submitted sample (Unit: ug/m²)

[illegible](PFOS) [illegible](PFOA)[illegible] ug/m²)

Test Item(s)/ [illegible]	Method(refer to)/ [illegible]	1	MDL
PFOS (Perfluorooctane Sulfonates) Σ{PFOS-acid, PFOS-salt} 全氟辛烷磺酰基化合物(PFOS) Σ{PFOS-酸, PFOS-盐}	(3)	ND	1
PFOA(Perfluorooctanoic Acid) Σ{PFOA-acid, PFOA-salt} 全氟辛酸(PFOA) Σ{PFOA-酸, PFOA-盐}		ND	1

Test Part Description:
1. Silvery metal board

Test Report **No. SH8022480-1/ CHEM** Date: Jun. 4, 2008 Page 4 of 5

Note :

(1) mg/kg=ppm
毫克每千克=百万分之 (mg/kg=ppm)

(2) ND = Not detected
ND=未检出

(3) MDL = Method Detection Limit
MDL =检测极限值

(4) Spot-test:
Negative = Absence of CrVI coating, Positive = Presence of CrVI coating;
(The tested sample should be further verified by boiling-water-extraction method if the spot test result is Negative or cannot be confirmed.)
Boiling-water-extraction:
Negative = Absence of CrVI coating
Positive = Presence of CrVI coating, the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm^2 sample surface area.
点测试法:
Negative= 镀层中未检测到六价铬, Positive = 镀层中检测到六价铬;
(当点测试结果为 Negative 或无法确定时,将采用沸水萃取法作进一步的结果验证。)
沸水萃取法:
Negative = 镀层中未检测到六价铬
Positive = 镀层中检测到六价铬; 表明 50 cm^2 表面积的被测试样品的沸水萃取液中六价铬的浓度等于或大于 0.02 mg/kg

SGS

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Sample photo:

SGS authenticate the photo on original report only

*** End of Report ***

Test Report **No. SH8022485-1/ CHEM** Date: Jun 4, 2008 Page 1 of 5

公司名称: 上海宝山钢铁股份有限公司
Company Name: SHANGHAI BAOSHAN IRON & STEEL CO., LTD
地址: 上海同济路 1800 号
Address: 6/F, 1800 TONGJI RD, BAOSHAN, SHANGHAI, CHINA

THIS REPORT IS TO SUPERSEDE TEST REPORT NO.SH8022485/CHEM DATE: 2008/03/20

样品名称: 热镀铝锌无铬耐指纹
TYPE OF PRODUCT CONTINUOUSLY HOT-DIP ALUMINUM-ZINC ALLOY COATED STEEL SHEET &STRIP ANTIFINGER TREATMENT WITHOUT HEXAVALENT CHROMUM
SGS 相关号: 10869348-31
SGS Ref No.: 10869348-31

收件日期(SAMPLE RECEIVED) Feb.27, 2008; Mar.17, 2008
测试日期(TESTING DATE). Feb.27 – Mar.05, 2008; Mar.17 – 20, 2008

Test Requested/测试要求

(1) To determine the Cadmium, Lead and Mercury content of the plating for submitted sample
测定委托样品镀层中镉, 铅, 汞的含量
(2) To determine the Hexavalent Chromium content of the plating for submitted sample
测定委托样品镀层中六价铬的含量
(3) To determine the PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid) content of the plating for submitted sample
测定委托样品镀层中全氟辛烷磺酰基化合物(PFOS) 和全氟辛酸(PFOA)的含量

试验方法/测试结果 : 见后续页
Test method/Test Results. Please refer to next page

Signed for and on behalf of
SGS-CSTC Chemical Laboratory

Ella Zhang
Section Manager

Signed for and on behalf of
SGS-CSTC Chemical Laboratory

Sandy Hao
Lab Manager

Test Report **No. SH8022485-1/ CHEM** Date: Jun. 4, 2008 Page 2 of 5

Test method/测试方法:

(1) Acid washing method for Cadmium, Lead and Mercury content in plating. Analysis was performed by Inductively Coupled Argon Plasma-Atomic Emission Spectrometer (ICP-AES) and Atomic Absorption Spectrometer (AAS).
酸洗脱方法测定镀层中的镉,铅和汞含量
采用ICP和AAS进行分析

(2) With reference to IEC 62321/2nd CDV (111/95/CDV) for Hexavalent Chromium by spot test / Colorimetric Method.
参照 IEC 62321/2nd CDV (111/95/CDV), 采用点测试法/比色法测定六价铬的含量

(3) With reference to EPA 3550C. 2000.
Analysis was performed by High Performance Liquid Chromatograph-Mass Spectrometer (HPLC-MS).
参照 EPA 3550C: 2000 方法, 采用 HPLC-MS 测试.

Test results by chemical method

(1)-(2) Cadmium, Lead ,Mercury and Hexavalent Chromium content of the plating for submitted sample. (Unit mg/kg)
样品镀层中镉, 铅, 汞和六价铬的含量(单位: mg/kg)

Test Item(s)/ 测试项目	Method(refer to)/ 方法(参见)	1	MDL
Cadmium (Cd) in plating/ 镀层中镉(Cd)	(1)	ND	10
Lead (Pb) in plating/ 镀层中铅(Pb)	(1)	26	10
Mercury (Hg) in plating/ 镀层中汞(Hg)	(1)	ND	10
Hexavalent Chromium (Cr VI)/ 六价铬(Cr VI)	(2)	Negative	See Note (4)/ 参见备注 (4)

Test Report **No. SH8022485-1/ CHEM** Date: Jun 4, 2008 Page 3 of 5

(3) PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid) content of the plating for submitted sample (Unit: ug/m²)

[illegible](PFOS) [illegible](PFOA)[illegible] ug/m²)

Test Item(s)/ [illegible]	Method(refer to)/ [illegible]	1	MDL
PFOS (Perfluorooctane Sulfonates) $\Sigma\{$PFOS-acid, PFOS-salt$\}$ 全氟辛烷磺酰基化合物(PFOS) $\Sigma\{$PFOS-酸, PFOS-盐$\}$	(3)	ND	1
PFOA(Perfluorooctanoic Acid) $\Sigma\{$PFOA-acid, PFOA-salt$\}$ 全氟辛酸(PFOA) $\Sigma\{$PFOA-酸, PFOA-盐$\}$		ND	1

Test Part Description:

1. Silvery metal board

Test Report **No. SH8022485-1/ CHEM** Date: Jun. 4, 2008 Page 4 of 5

Note :

(1) mg/kg=ppm
毫克每千克=百万分之一(mg/kg=ppm)

(2) ND = Not detected
ND=未检出

(3) MDL = Method Detection Limit
MDL =检测极限值

(4) Spot-test:
Negative = Absence of CrVI coating, Positive = Presence of CrVI coating;
(The tested sample should be further verified by boiling-water-extraction method if the spot test result is Negative or cannot be confirmed.)
Boiling-water-extraction:
Negative = Absence of CrVI coating
Positive = Presence of CrVI coating, the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm^2 sample surface area.
点测试法:
Negative= 镀层中未检测到六价铬, Positive = 镀层中检测到六价铬;
(当点测试结果为 Negative 或无法确定时,将采用沸水萃取法作进一步的结果验证。)
沸水萃取法:
Negative = 镀层中未检测到六价铬
Positive = 镀层中检测到六价铬; 表明 50 cm^2 表面积的被测试样品的沸水萃取液中六价铬的浓度等于或大于 0.02 mg/kg

Test Report **No. SH8022485-1/ CHEM** Date: Jun. 4, 2008 Page 5 of 5

Sample photo:

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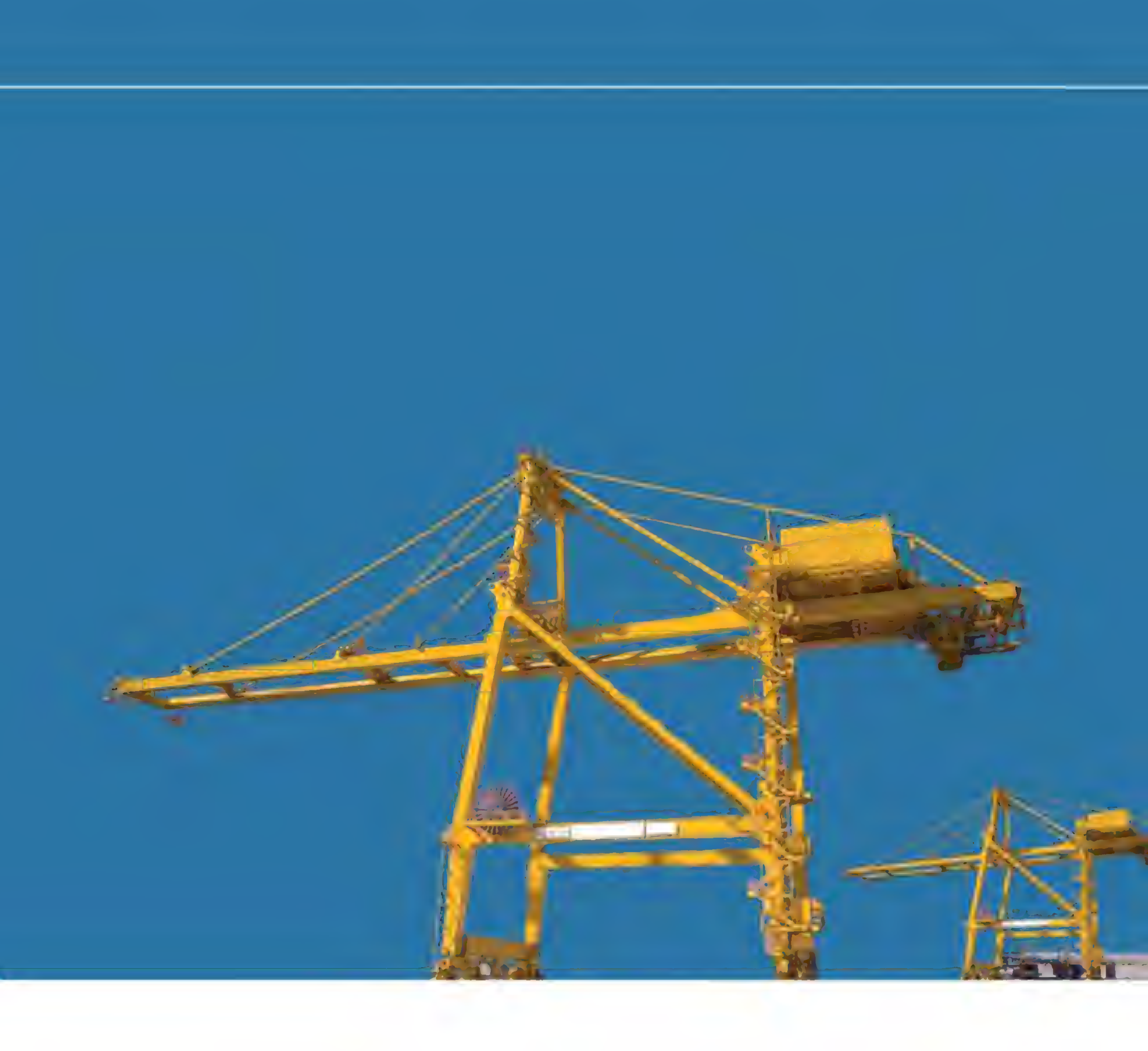
*** End of Report ***

Warehousing and Transportaion Service

仓储运输服务



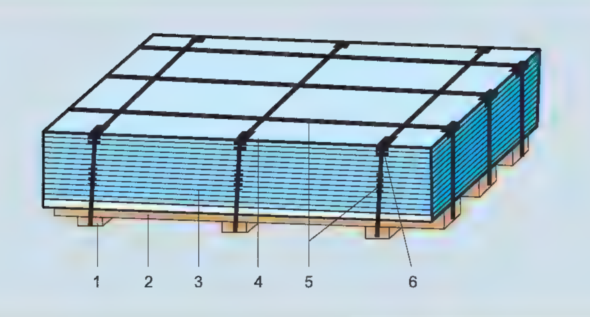


图 1：冷轧；镀锌
Figure 1: cold rolled; galvanized

1- 托架；2- 底板；3- 钢板；4- 盖板；
5- 捆带及锁扣；6- 护角

- **包装方式：**
  1、用上、下盖板包裹；
  2、角部捆扎处衬护角；
  3、捆扎道次：纵横各不少于 3 道；
  4、用垫木或钢木托架。
- **适用范围：**
  附近地区的直接用户
- **标志：**标签不少于二个
- **捆（包）重量（吨）：**3.0～5.0

1-bracket; 2-baseplate; 3-steel sheet; 4-cover plate;
5-strap and strap lock; 6-angle bead

- Packaging mode:
  1. packaged with top and bottom cover plate
  2. angle bead used where the edge is wrapped and tied
  3. number of strapping: a minimum of 3 courses of strap latitudinally and longitudinally made.
  4. use of skid or steel-wood pallet
- Range of application:
  Direct customers in the vicinity of the plant
- Marking: at least two labels attached
- Weight (in tons): 3.0-5.0

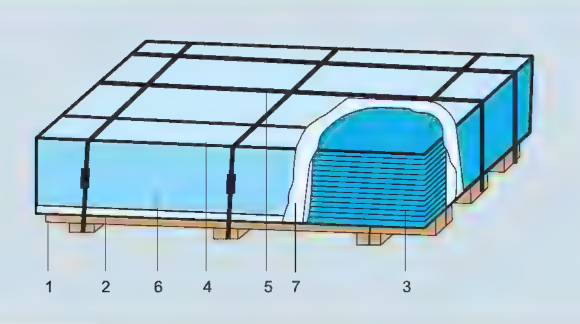


图 2：冷轧；镀锌
Figure 2: cold rolled; galvanized

1- 托架；2- 下盖板；3- 钢板；4- 盖板；
5- 捆带及锁扣；6- 侧护板；7- 防锈纸

- **包装方式：**
  1、用专用防锈纸或中性纸包裹；
  2、用塑料薄膜覆盖；
  3、用上、下盖板和侧护板包裹；
  4、捆扎道次：纵横各不少于 3 道；
  5、用垫土或钢木托架。
- **适用范围：**
  市内及江浙一带用户
- **标志：**标签不少于二个
- **捆（包）重量（吨）：**3.0～5.0

1-bracket; 2-bottom cover; 3-steel sheet; 4-cover plate;
5-strap and strap lock; 6-side cover; 7-rust-poof paper

- Packaging mode:
  1. wrapped in dedicated rust-poof paper or neutral paper
  2. covered with plastic membrane
  3. packaged with top and bottom cover and side cover
  4. number of strapping: a minimum of 3 courses of strap latitudinally and longitudinally made.
  5. use of skid or steel-wood pallet
- Range of application:
  Customers within Shanghai and those in Jiangshu and Zhejiang provinces
- Marking: at least two labels attached
- Weight (in tons): 3.0-5.0

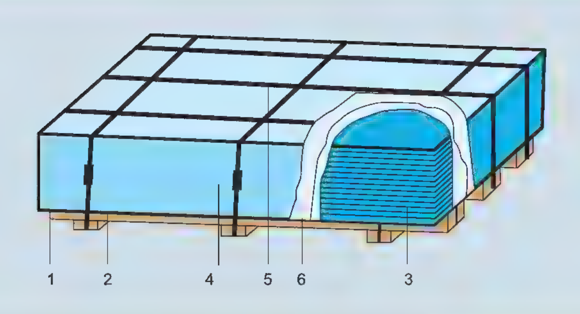


图 3：冷轧；镀锌
Figure 3: cold rolled; galvanized

1- 托架；2- 下盖板；3- 钢板；4- 包装铁盒；5- 捆带及锁扣；6- 防锈纸：塑料薄膜

- **包装方式**：
  1、用专用防锈纸或中性纸包裹；
  2、用塑料薄膜覆盖；
  3、用包装铁盒罩盖包装(含浅盒加侧护板包装和全盒式包装);
  4、捆扎道次：纵横各不少于 3 道；
  5、用垫木或钢木托架。
- **适用范围**：
  需远途运输、出口的产品
- **标志**：标签不少于二个
- **捆(包)重量(吨)**：3.0～5.0

1-bracket; 2-bottom cover; 3-steel sheet; 4-steel package box; 5-strap and strap lock; 6-rust-poof paper, plastic membrane;

- Packaging mode:
  1. wrapped in dedicated rust-poof paper or neutral paper
  2. covered with plastic membrane
  3. packaged in steel package box/cover (including packaging with short cover and side guard-plate, and in full box package)
  4. number of strapping: a minimum of 3 courses of strap latitudinally and longitudinally made.
  5. use of skid or steel-wood pallet
- Range of application:
  Applicable for long-haul transportation or for export purpose.
- Marking: at least two labels attached
- Weight (in tons): 3.0-5.0

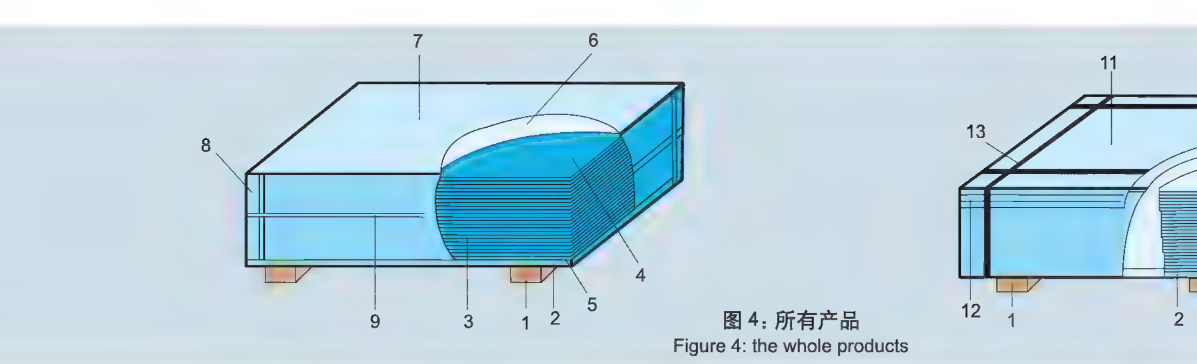


图 4：所有产品
Figure 4: the whole products

1- 木台；2- 下盖板；3- 钢板；4- 上盖板；5- 底部瓦楞纸；6- 防锈纸；7- 上部瓦楞纸；8- 边部护角；9- 周向捆带 (内)；10- 围板；11- 铁盒；12- 周向捆带 (外)；13- 横向捆带 (外)；14- 纵向捆带 (外)

- **包装方式：**
  1、内、外圈用专用防锈纸或中性纸包裹；
  2、外周加外周包板；
  3、捆扎处加纸外护角；
  4、端部加铁内护角；
  5、捆扎道次：径向、圆周各不少于 3 道。
- **适用范围：**适用于本市及附近直接用户
- **标志：**标签不少于二个，并粘贴怕湿、小心轻放、向上或开卷方向标志。
- **捆 (包) 重量 (吨)：**3.0～5.0

1-wood bracket; 2-bottom cover; 3-steel sheet; 4-top cover; 5-bottom corrugated paper; 6-rust-proof paper; 7-top corrugated paper; 8-side corner guard; 9-circumferential banding strip (inner); 10-guard plate; 11-steel package box; 12-circumferential banding strip (outer); 13-horizontal banding strip (inner); 14-vertical banding trip (outer)

- Packaging mode:
  1. Inner peripheral and external peripheral were wrapped in dedicated rust-proof paper or neutral paper;
  2. Wrapped in external peripheral wrapping plate;
  3. Paper external corner guard used wherever is wrapped and tied;
  4. Iron inner corner guard used at the ends;
  5. Number of strapping: a minimum of 3 course of strap radially and circumferentially made.
- Range of application: Suitable for the directly-supplied users within this city or adjacent area
- Marking: at least two labels attached, with signs of "keep away from damping", "handle with care", "up" and "unwinding direction" on it.
- Weight (in tons): 3.0-5.0

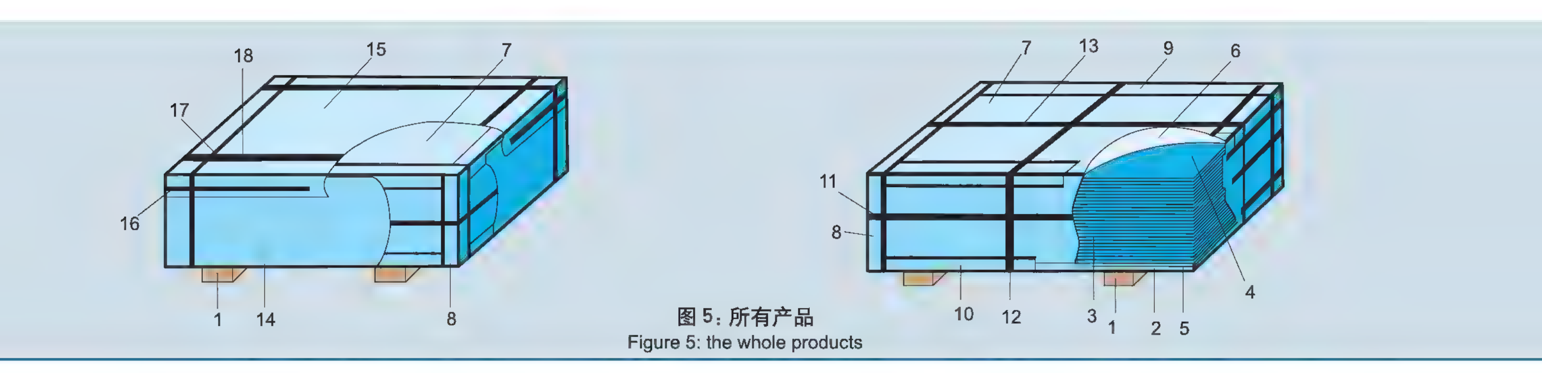
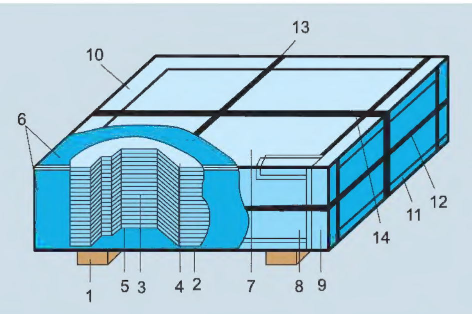
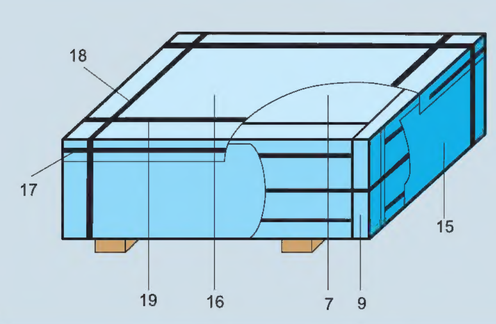


图 5：所有产品
Figure 5: the whole products

1- 木台；2- 底板；3- 钢板；4- 盖板；5- 底部瓦楞纸；6- 防锈纸；7- 上部瓦楞纸；8- 边部护角；9- 上部护角；10- 下部护角；11- 周向捆带 (内)；12- 横向捆带 (内)；13- 纵向捆带 (内)；14- 围板；15- 铁盒；16- 周向捆带 (外)；17- 横向捆带 (外)；18- 纵向捆带 (外)

- **包装方式：**
  1、内、外圈用专用防锈纸或中性纸包裹；
  2、端部加纸内、外护角；
  3、内、外圈分别用外周包板和内周护板封闭包装；
  4、端部加铁圆护板，铁内、外护角；
  5、捆扎道次：径向、圆周不少于 3 道。
- **适用范围：**国内北方市场
- **标志：**标签不少于二个，并粘贴怕湿、小心轻放、向上或开卷方向标志。
- **捆 (包) 重量 (吨)：**3.0～5.0





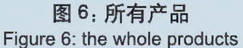


图 6：所有产品

Figure 6: the whole products

1- 木台；2- 底板；3- 钢板；4- 盖板；5- 底部瓦楞纸；6- 防锈纸；7- 上部瓦楞纸；8- 端面瓦楞纸；9- 边部护角；10- 上部护角；11- 下部护角；12- 周向捆带（内）；13- 横向捆带（内）；14- 纵向捆带（内）；15- 围板；16- 铁盒；17- 周向捆带（外）；18- 横向捆带（外）；19- 纵向捆带（外）

- **包装方式：**
  1、内、外圈用专用防锈纸或中性纸包裹；
  2、加塑料套；
  3、端部加纸内、外护角，圆护瓦愣纸；
  4、用外周瓦愣纸；
  5、内、外用外周包板和内周护板封闭包装；
  6、端部加铁圆护板，铁内、外护角；
  7、捆扎道次：径向、圆周不少于 3 道。
- **适用范围：**国内南方市场
- **标志：**标签不少于二个，并粘贴怕湿、小心轻放、向上或开卷方向标志。
- **捆（包）重量（吨）：**3.0～5.0

1-wood bracket; 2-bottom sheet; 3-steel sheet; 4-cover; 5-bottom corrugated paper; 6-rust-proof paper; 7-top corrugated paper; 8-end corrugated paper; 9-side corner guard; 10-top corner guard; 11-bottom corner guard; 12-circumferential banding strip (inner); 13-horizontal banding strip (inner); 14-vertical banding trip (inner); 15-guard plate; 16-steel package box; 17-circumferential banding strip (outer); 18-horizontal banding strip (outer); 19-vertical banding trip (outer)

- Packaging mode:
  1. Inner peripheral and external peripheral were wrapped in dedicated rust-proof paper or neutral paper;
  2. Attached with plastic sleeve;
  3. Paper inner corner guard, paper external corner guard and round corrugated paper guard used at the ends;
  4. Attached with external peripheral corrugated paper;
  5. Close packaged with external peripheral wrapping plate and inner peripheral over for internal peripheral and external peripheral respectively;
  6. Steel round cover, steel inner corner guard and steel external corner guard add at the ends;
  7. Number of strapping: a minimum of 3 course of strap radially and circumferentially made.
- Range of application: Suitable for the market of the South of China
- Marking: at least two labels attached, with signs of "keep away from damping", "handle with care", "up" and "unwinding direction" on it.
- Weight (in tons): 3.0-5.0

1-wood bracket; 2-bottom sheet; 3-steel sheet; 4-cover; 5-bottom corrugated paper;6-rust-proof paper; 7-top corrugated paper; 8-side corner guard;9-top corner guard; 10-bottom corner guard; 11-circumferential banding strip (inner);12-horizontal banding strip (inner); 13-vertical banding trip (inner); 14-guard plate;15-steel package box; 16-circumferential banding strip (outer); 17-horizontal banding strip (outer); 18-vertical banding trip (outer)

- Packaging mode:
  1. Inner peripheral and external peripheral were wrapped in dedicated rust-proof paper or neutral paper;
  2. Paper inner corner guard and paper external corner guard used at the ends;
  3. Close packaged with external peripheral wrapping plate and inner peripheral cover for internal peripheral and external peripheral respectively;
  4. Iron round cover, iron inner corner guard and iron external corner guard add at the ends;
  5. Number of strapping: a minimum of 3 course of strap radially and circumferentially made.
- Range of application: Suitable for the market of the North of China
- Marking: at least two labels attached, with signs of "keep away from damping", "handle with care", "up" and "unwinding direction" on it.
- Weight (in tons): 3.0-5.0

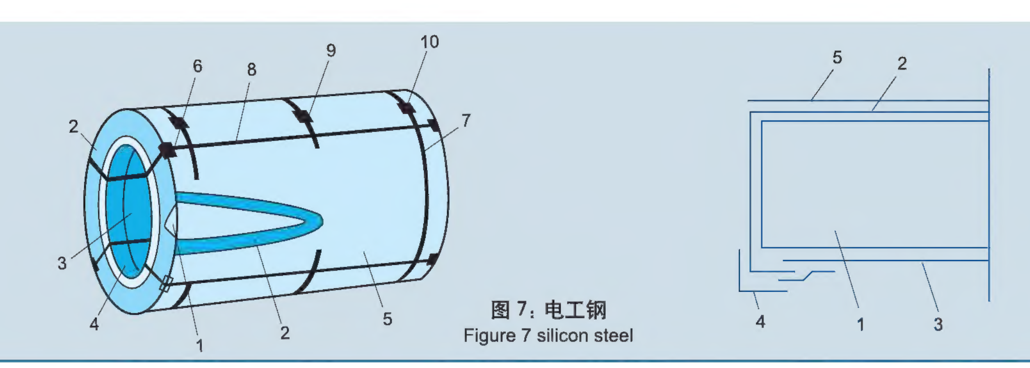


图 7：电工钢
Figure 7 silicon steel

1- 钢卷；2- 外周防锈纸；3- 内芯防锈纸；4- 铁内护角；
5- 外周包板；6- 纸外护角；7- 周向捆带；8- 径向捆带；
9- 锁扣垫片；10- 锁扣

- **包装方式：**
  1、分条钢卷之间加缓冲材料
  2、用硅钢专用防锈纸进行全封闭包装；
  3、用塑料套全封闭包装；
  4、外周加外周包板；
  5、顶部加纸外护角圆盒盖；
  6、底部加圆形瓦愣纸；
  7、捆扎道次：周向不少于三道，十字 2 道；
  8、立式木托架。
- **适用范围：**适用于本市及附近直接用户
- **标志：**标签不少于二个；粘贴怕湿、小心轻放和开卷方向标志。
- **捆（包）重量（吨）：**3.0～5.0

1-steel coil; 2-external peripheral rust-proof paper; 3-inner core rust-proof paper; 4-iron inner corner guard; 5-external peripheral wrapping plate; 6-paper external corner guard; 7-circumferential banding strip; 8-radial banding strip; 9-shim for lock; 10-lock

- Packaging mode:
  1. Cushion materials used between divided steel coils;
  2. Close wrapped in dedicated rust-proof paper for silicon steel;
  3. Close packaged with plastic sleeve;
  4. Wrapped in external peripheral wrapping plate;
  5. Paper external corner guard and roun cover used at the top;
  6. Adding round corrugated paper at the bottom;
  7. Number of strapping: a minimum of 3 course of strap circumferentially made, 2 course of strap crossly made;
  8. Use of vertical wood pallet
- Range of application: Suitable for the directly-supplied users within this city or adjacent area
- Marking: at least two labels attached, with signs of “keep away from damping”, “handle with care” and “unwinding direction” on it.
- Weight (in tons): 3.0-5.0

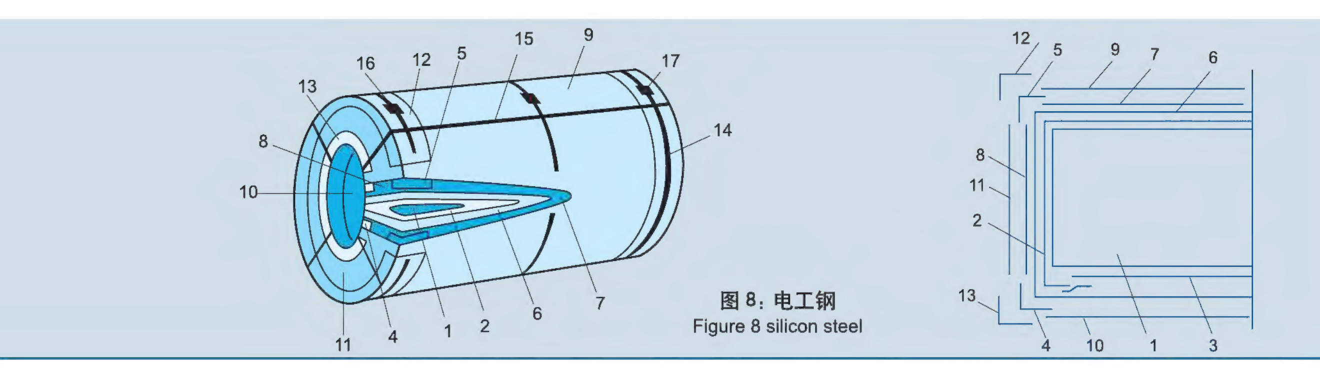


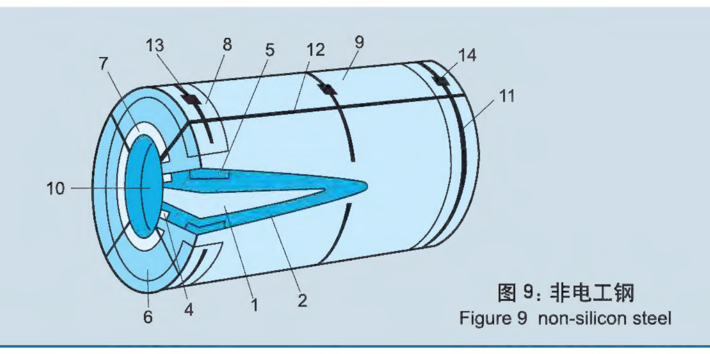
图 8：电工钢
Figure 8 silicon steel

1- 钢卷；2- 外周防锈纸；3- 内芯防锈纸；4- 纸内护角；
5- 纸外护角；6- 塑料套；7- 外周瓦楞纸；8- 圆护瓦楞纸；
9- 外周包板；10- 内周护板；11- 铁圆护板；12- 铁外护角；
13- 铁内护角；14- 周向捆带；15- 径向捆带；16- 锁扣垫片；
17- 锁扣

1-steel coil; 2-external peripheral rust-proof paper; 3-inner core rust-proof paper; 4-paper inner corner guard; 5-paper external corner guard; 6-plastic sleeve; 7-external peripheral corrugated paper; 8-round corrugated paper guard; 9-external peripheral wrapping plate; 10-inner peripheral guard plate; 11-iron round cover; 12-iron external corner guard; 13-iron inner corner guard; 14-circumferential banding strip; 15-radial banding strip; 16-shim for lock; 17-lock

- **包装方式**：
  1、用硅钢专用防锈纸全封闭包装；
  2、周塑料套全封闭包装；
  3、外周加包周包板；
  4、顶部加纸外护角、圆盒盖和铁外护角；
  5、底部加圆形瓦愣纸；
  6、捆扎道次：周向不少于 3 道，十字 2 道；
  7、立式木托架。
- **适用范围**：可用于远距离运输
- **标志**：标签不少于二个；粘贴怕湿、小心轻放和开卷方向标志。
- **捆（包）重量（吨）**：3.0～5.0

- Packaging mode:
  1. Close wrapped in dedicated rust-proof paper for silicon steel;
  2. Close packaged with plastic sleeve;
  3. External peripheral wrapping plate used for external peripheral;
  4. Paper external corner guard, Round cover and iron external corner guard used at the top;
  5. Adding round corrugated paper at the bottom;
  6. Number of strapping: a minimum of 3 course of strap circumferentially made, 2 course of strap crossly made;
  7. Use of vertical wood pallet
- Range of application: Applicable for long-haul transportation
- Marking: at least two labels attached, with signs of "keep away from damping", "handle with care" and "unwinding direction" on it.
- Weight (in tons): 3.0-5.0



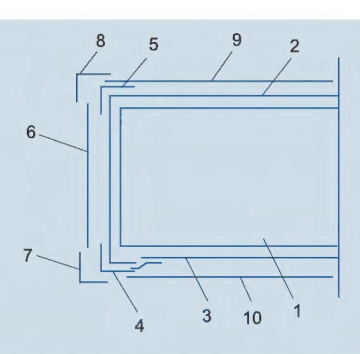


图 9：非电工钢
Figure 9 non-silicon steel

1- 钢卷；2- 外周防锈纸；3- 内芯防锈纸；4- 纸内护角；5- 纸外护角；6- 铁圆护板；7- 铁内护角；8- 铁外护角；9- 外周包板；10- 内周护板；11- 周向捆带；12- 径向捆带；13- 锁扣垫片；14- 锁扣

- **包装方式**：
  1、用专用防锈纸或中性纸全封闭包装；
  2、用塑料套全封闭包装；
  3、端部加纸内、外护角；
  4、底部使用铁外护角和圆护铁板；
  5、外周加外周包板；
  6、顶部使用圆盒盖和铁外护角；
  7、捆扎道次：周向不少于 3 道，十字 2 道；
  8、立式木托架；
  9、适用于远距离运输。
- **适用范围**：适用于远距离运输
- **标志**：标签不少于二个；粘贴怕湿、小心轻放和开卷方向标志。
- **捆（包）重量（吨）**：3.0～5.0

1-steel coil; 2-external peripheral rust-proof paper; 3-inner core rust-proof paper; 4-paper inner corner guard; 5-paper external corner guard; 6-iron round cover; 7-iron inner corner guard; 8-iron external corner guard; 9-external peripheral wrapping plate; 10-inner peripheral guard plate 11-circumferential banding strip; 12-radial banding strip; 13-shim for lock; 14-lock

- Packaging mode:
  1 Close wrapped in dedicated rust-proof paper or neutral paper;
  2 Close packaged with plastic sleeve;
  3 Paper inner corner guard and paper external corner guard used at the ends;
  4 Iron external corner guard and iron round cover used at the bottom;
  5 External peripheral wrapping plate used for external peripheral;
  6 Round cover and iron external corner guard used at the top;
  7 Number of strapping: a minimum of 3 course of strap circumferentially made, 2 course of strap crossly made;
  8 Use of vertical wood pallet
  9 Applicable for long-haul transportation
- Range of application: Applicable for long-haul transportation
- Marking: at least two labels attached, with signs of "keep away from damping", "handle with care" and "unwinding direction" on it.
- Weight (in tons): 3.0-5.0

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JD0809C0101
2008.9印刷于中国上海